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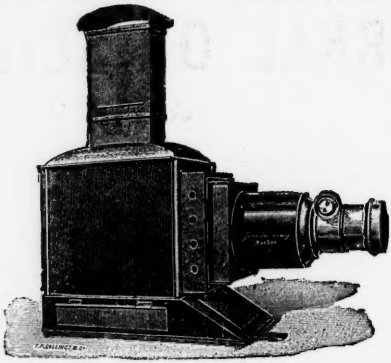

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XUM

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THE

JOURNAL OF SCIENCE.

JANUARY, 1881.

I. LIFE AND ITS BASIS.

By J. H. BARKER, M.A.

PART I.—*Vegetable Life.*

AMONG the many new "ologies" to which the rapid progress of Science in the present age has given birth, none perhaps are at once so interesting and so encompassed with difficulties as Biology and Psychology; and for this obvious reason, that these subjects lie upon the very boundary of the "vast unknown," and trench to no small extent upon the domain of Philosophy, secular or sacred,—indeed upon that of both,—demanding a reverent caution, and entire freedom from dogmatism in the handling of them.

While offering a few suggestions upon the former of these two subjects, I shall make no attempt to criticise the views of others,—a task wholly impossible within the limits of a short article like the present,—but content myself with stating the conclusions at which I have myself arrived.

The problem of Life may well be termed, *par excellence*, the "Crux" of Science. As the Duke of Argyll observes, in a recent article on 'The Unity of Nature,'—in the "Contemporary,"—"Science has cast no light on the ultimate nature of life." Familiar as we are with the fact and the phenomena of life, its actual nature seems for ever to elude our grasp. Science can experiment *ad libitum* upon non-living matter, and to a certain limited extent upon the *living*, and is compelled to confess that a vast difference exists between them. It can apply its microscope, and discern the wonderful and minute motions peculiar to life, at least in its active state, and can estimate the effects which chemical

and physical stimuli produce on it; but the question, What *is* life? remains without any satisfactory answer.

Few, if any, of the definitions of *life* are more than an enunciation of some of the principal phenomena presented by living beings. They may be very true as accounts of the *actings* of life, but they tell us nothing as to its nature. These phenomena are *effects*, but what is their *cause?* The conviction is irresistible that there is *something*—a *quicquid ignotum*—behind them, which is beyond our ken. And so, no doubt, there is.

But, after all, is Life a *thing* at all? Is it a distinct *entity*, which can be properly said to be attached or added to, or taken from, matter? In conventional language, life may be said to *dwell* in an organism, or to *depart* or be *taken* from it. But it does not follow that this is philosophically correct in respect of either of the great provinces of life. And the main object of the present article will be to show that there is good ground for thinking that the vital principle, in our own world at least, is *not* a separate entity, such as Mind and Matter are; nor yet molecular motion in matter, as some will have it to be, but a temporary state of certain kinds of matter, which is produced and regulated in them by "mind."

In an enquiry of this nature precision in the use of terms is of essential importance. When this is neglected the reader is often left in a mental fog, the word "life" being sometimes used for its "principle," sometimes for its attributes or phenomena; and again, for its duration, or still more frequently, for the whole series of living things around us. I shall endeavour to avoid this confusion of thought, and to restrict the word to the first of these meanings, viz., the principle which distinguishes (to use Prof. Haeckel's phraseology) the *organa* from the *anorgana*.

I may further observe, *in limine*, that many physiologists speak of this principle as a force or power controlling, to a certain extent, the physical forces of Nature. This, which is quite true phenomenally, seems necessarily to imply that they regard it as a being possessing power and intelligence, and exerting volition. Another school of physicists, taking note of the perpetual motion manifested in the minutest molecules which can be discerned in animal and vegetable* cells, are disposed to identify the causes of these living motions with those of the motions exhibited in inorganic

* I should prefer myself to adopt Henslow's terminology, "vegetal," when used as an adjective, on etymological grounds, but conform here to the common usage.

matter, such as heat, electricity, or magnetism.* To this view I may have to revert in a subsequent part of this paper.

It is now generally agreed that life (on our earth at least) is never found except as associated with a certain chemical compound to which the name of "protoplasm" has been assigned, consisting of the elements carbon, hydrogen, oxygen, and nitrogen, technically represented as CHON—animal forms comprising all four, while vegetables, with a few exceptions, contain only the first three. In the living organisms the proportions of these elements vary indefinitely, and also include some other elements, as phosphorus, &c. It is, however, by no means certain that protoplasm is chemically identical in the two kingdoms of Nature, or even that it is precisely the same in every species.

But let us assume that Prof. Huxley was justified in considering this albuminous compound to be "the physical basis of life,"—indeed "the *matter* of life,"—and that, in reality, all living structures are built upon this foundation. No one will contend, however, that this arrangement was a *necessary* one. It is quite as conceivable that life might have been conferred on portions of elementary matter, as metals or gases. If any reason can be assigned for the actual basis being an unstable compound, it is that it was *intended* that this *basis* should be liable to change and dissolution,—*i.e.*, that it was designed to be only a temporary provision.

There is, however, another general consideration, the importance of which is often underrated. It has been assumed, with respect both to protoplasm and to the organised tissues produced from it, that the static condition of the component elementary substances in them is the same in the living and the dead state. Now chemical analysis can only deal with matter in its non-living state; and however exact this analysis may be, it is really begging the question to assume that the component elements are in the same state in living and in non-living organisms. Sulphur, phosphorus, carbon, and oxygen itself, are known to be susceptible of different forms or states: and of these differences chemistry can give no account, in the present state at least of our knowledge. Living protoplasm, therefore, may be something more than a mere chemical compound. The chemist may unite the elements CO and produce carbonic acid, or HN and form ammonia, or HO and exhibit water. He may further imitate the operations of organic chemistry, and form some of the

* *See* HUXLEY'S Lay Sermon on Protoplasm.

simpler products (*e.g.*, urea); but he has never yet succeeded in forming albumen, much less living protoplasm, without the aid of matter which is already in a living state. But this power does appear to be possessed by living matter, both vegetable and animal. The former acts upon the binary compounds above mentioned when in immediate contact, under certain conditions of temperature, and appropriates some of their elements, which it seems to imbue with its own life and special character; it *assimilates* them. But, let it be observed, this action is confined to *some* of the elements, to the exclusion of others. It is a case of what may most properly be called "Natural Selection." The living substance may be said to *choose* its food, for it is thus that it *grows*.

Deeply interesting and instructive are the revelations of microscopic physiology, as exhibited, for example, in Dr. L. Beale's well-known work on "Protoplasm and Life." But I can only here allude to a *dictum* which he was fully competent to pronounce, that "the progression from the inorganic to the living is not to be traced step by step. The change is instantaneous. The life *flashes*, as it were, into the inanimate particles, and they *live*." *

Perhaps the best path to take, in order to reach a definite conclusion in regard to the subject before us, will be to trace the history of an individual organism during its term of life. Let us begin with the vegetable. We must start, of course, with the seed, or rather with the germinal cell, which is the origin of the future plant. But a difficulty meets us at once; for the earliest form to which this germ can be traced is nothing but an atom of simple undifferentiated jelly, largely composed of water, without any apparent structure. But have we gone back far enough even now? This atom of protoplasm is *already alive*. It is, however, composed of elements which at one time were non-living, viz., carbon, hydrogen, and oxygen. These elements are now chemically united in the proportions which form albumen. But what force united them thus? Prof. Haeckel† and other writers of the same school start from the formed chemical substance; but they should begin at least one step farther back in their analysis before it can be called exhaustive. For what are these same chemical affinities to which they ascribe the origination of vitality? Are the elementary substances—carbon, &c.—*living beings*, who can

* Beale's Protoplasm and Life, p. 278.
† *See* History of Creation, vol. i., chap. xiii..

choose to combine in definite atomic ratios? They may indeed *seem* to be alive, if motion is to be taken as an adequate proof of life. Indeed, upon this ground, Haeckel consistently enough argues (vol. i., p. 23) that "all material bodies which are known are equally animated." This may indeed be a real and a grand truth, though in a sense perhaps not intended by its author.

But if this were granted, it does not prove that there is no *difference* between the forces which produce living and non-living things; for the same principle or power may surely act in widely diverse manners, in order to produce certain results. Physico-material motions and physico-vital movements, as they alike require and imply power for their cause, so do they alike demand intelligence to direct and apply them.

To proceed with our history. We have now got a non-living compound called protoplasm, as the result of the action of some power upon inert manner. But how does it become *living*? All investigation seems to show that, while the contact of living protoplasm is indispensable to this process, nothing tangible is added to the non-living matter. Dr. Huxley compares it to the change of oxygen and hydrogen into water, under the term "aquosity," but confesses that the influence of living upon dead matter is "unintelligible" ("Lay Serm.," p. 150). It is so except upon one hypothesis, that a power is here acting which proceeds upon the rule or method (as far as we can scrutinise it) to commence from living matter, and to vivify particles in immediate contact with it,—not to communicate life to unattached inorganic matter. To infer from this, however, that such an action *never* takes place, is illogical and unphilosophical; and still more so, that it cannot and never has taken place. Even Haeckel admits that in certain primeval conditions of the earth's surface "spontaneous generation," or, as it should more accurately be expressed, the vivification of inorganic elements, may have occurred (*see* "Hist. of Creation," vol. i., p. 341). The term "spontaneous" was intended to refer to the "will" of the living being, who was supposed capable of calling itself into existence—a palpable absurdity. But if it is called into being by the *will* of another, the hypothesis becomes a reasonable one—indeed the equivalent of "creation." And what essential difference, it may be asked, is there between the two cases? In the one there is contact with living matter, and in the other not; and that is all. Nor can we be sure that any contact, however close, would make the transfer of life a necessary consequence. The

contact of the "bioplast" (to use Dr. Beale's apt phrase) with "formed" or dead matter is as close as can be imagined; but the transfer of "life" has ceased. The initiation, therefore, of the living state in the lifeless, *whether it has formerly been alive or not*, must be due to the action of an unseen higher power.

This remark applies to all vegetative growth in earth and air and sea, and must have been equally so at every instant during countless past ages, since vegetation first appeared upon our planet. And the first giving of "life" to the lifeless, to form it into the simplest vegetable cell, must (I conceive) have been the very same in whatever part of the terraqueous globe it appeared. It may be, as Darwin and others suppose, that a few primordial speciea of plants were originally formed, from which all other forms have sprung by ordinary propagation. But it is this "ordinary propagation" itself that involves, at every step, an action which exact thought cannot distinguish from the first impartation of life to inert matter. The fact that the same process is for ever going on under our eyes must not be allowed to blind us to the rational inference, that the action and the power are virtually the same in both cases; although the original act is called "creation," and the perpetual act "a natural process": both alike imply the exertion of power and will.

I may be allowed to fortify my argument on this point by the remarkable admissions of two eminent scientists of the present day. In his famous "Belfast Address" (p. 54) Prof. Tyndall, referring to Darwin's idea above alluded to, says that "the anthropomorphism which it seemed his object to set aside is as firmly associated with the creation of a few forms as of a multitude. We need clearness and thoroughness here. Two courses, and two only, are possible. Either let us open our doors freely to the conception of creative acts, or, abandoning them, let us radically change our notions of matter." This means that the belief that matter is, *per se*, *passive*, carries with it the belief in creative acts. In this I fully concur, for the contrary view virtually turns *Matter* into *Mind*.

In discussing the possibility of Spontaneous Generation, Prof. Haeckel ("Hist. of Creation," vol. i., p. 348) adduces the case of the Monera. In his classification of living things he makes a *third* kingdom of the lowest organisms in both the ordinary departments of life, and terms them "Protista," of which the Monera are the simplest and perhaps lowest forms. The following remarks will therefore

hold good either for animals or vegetables. And he finds himself in this dilemma: *either* these organisms must have been created millions of years ago, and propagated themselves unchanged until now,—a conclusion directly subversive of Darwin's views and his own,—*or* they must have been, and may even now be, produced by spontaneous generation. To escape from the former alternative he throws himself upon the latter, which, by his own showing, means that dead or inert matter can *give itself life!*—a manifest absurdity. But it is no absurdity to suppose that a Supreme Mind may, at any time, confer life upon non-living matter, seeing that this process is constantly going on both in the animal and vegetable worlds.

I have dwelt at some length upon this part of my subject, because it is the crucial point of the controversy respecting life. It is perfectly true, as Dr. Beale maintains, that there is the greatest conceivable difference between living and non-living things. But the real efficient cause of these different conditions of matter must be one co-extensive with the living world around us,—indeed, as we have already seen, with the whole inorganic world and the activities manifested in it.

To return now to our living protoplasm, or *bioplasm* as Dr. Beale calls it. If it is to grow into a *plant* the three elements C, O, and H will suffice as components. We have supposed it to be the inceptive particle of the nascent germ. To this basis are attached from the substance of the seed, which is yet soft protoplasm, cells and groups of cells,—and the germ *grows*. But it grows not at random, but in a different and yet definite manner for each particular kind of plant. What power, then, guides and adjusts these cells that they produce specific forms? But now the seed with its enclosed germ is completed; it is ripe; *i.e.*, the water it contained is either evaporated or decomposed, and the seed (let it be a grain of corn) may now remain in what seems a lifeless state for years, and even for ages, and may yet at last *spring* into life. Now this involves some theory of *dormant* life; but how can such dormancy, or the continued existence of life, be anything more than an assumption, when it is only by *active* motions that the presence of life is proved? The fact that the combined action of light and heat, of air and water, revives the dry germ and restores it to life, only proves that the germ has not been disintegrated, and that the activity of those elements is the *means* of restoring the vital condition to it; in short, that this dormancy is the temporary cessation of the action which we recognise as *life*.

But I wish to observe here that *conditions* necessary to life are not the *causes* of it. The human mind has the power of constructing and putting together the various parts of a machine, and of imposing the *conditions* of its action, and it is that *mind* that is the *cause* of its acting in any particular way. Just so are the "presence" and agency of *mind* absolutely requisite to initiate and continue the motions which, as far as physical evidence goes, constitute vegetable life.*

It is not necessary for my present purpose to enter further into the mysterious arcuna of vegetable embryology. The same principle of life, whatever it be, undoubtedly presides over all the multifarious functions and processes of vegetable organisation. Its progress is a succession of alternations of life and death; first of the material particles which compose the organism, and then the death of the whole organism. It is a perpetual entry and departure of the atoms of the "anorgana" into the substance of the organism; and, as *life* is the continuance of this action, so death is its cessation, in any molecule, or organ, or individual plant. With regard to one of the main conditions of vitality, viz., certain degrees of temperature, it is only by observation and experiment that we can know the range of heat which is compatible with the continuance of life in any particular case. In a large majority of instances it appears to be very limited; but it is difficult to imagine any physical necessity for the appointment. All we can say is, that *so it is*. It has been particularly observed *àpropos* of the experiments made by the late Mr. Crosse, which were at the time thought by many physicists to prove the theory of spontaneous generation, that though it was assumed that the heat of boiling water had which his infusions were subjected *must necessarily* have destroyed every living germ, yet the fact of the reappearance even when air was excluded, of amœboid forms of life, rather went to prove that their germs were capable of passing through such a temperature *without* losing their vitality. On the other hand, we do not know *what* degree of *cold* a seed when quite dry will bear without its germinating power being destroyed; or, more correctly, what limits are actually set to their restoration to the vital state in regard to the temperature to which they may be exposed.

But a question here suggests itself, which I have no reason to blink, viz., whether some of the vital phenomena of plants do not indicate the presence of a power of choice and selection in the individual organism itself exerted for its own

* See Sir J. HERSCHEL'S Popular Lectures, p. 458.

purpose. If such individual choice could be clearly proved, it would seem to carry with it the admission of the existence of a physical entity in each separate plant, and indeed in every separate cell, which would be equivalent to regarding vegetable life as an assemblage of such entities, undistinguishable from those of animals. On this subject, however, we cannot do better than accept the opinion expressed by Mr. Darwin in his new work on "The Power of Movement in Plants." He traces the remarkable actions of many plants, which he describes under the name of *circumnutation*, to the influence of external conditions, as light, heat, electricity, &c., causing various contractions and expansions of their cellular tissues, rather than to the existence of any internal cause. But this interesting though admittedly obscure branch of vegetable physiology abounds with instances of contrivance, which clearly prove *design*, and indicate the presence of will and purpose in an unmistakable manner, somewhere.

It has become an axiom in physiology that chemistry is controlled and often suspended by life. The explanation of this phenomenon by our present theory is easy and direct. Both activities are in reality manifestations of the same power working in different ways, and the last dominates the other, when the purposes of the living organism are to be answered by it. When these purposes have been fulfilled, and the living state has ceased to exist, the ordinary chemical forces predominate, and dissolve the organism into its former elements.

I have more than once had occasion to advert to the conditions in which living vegetation exists, such as air, water, light, heat, &c. And there is no question as to the large part these conditions play in the ever-shifting scenery of this most beatiful department of Nature. But with regard to the last-mentioned influences, something more remains to be said. Believing, as I do, in the highly probable doctrine that the three constituents of the solar ray, heat, light, and actinism, are only different rates of vibration in the same medium, viz., the æther, and that, moreover, this medium is suffused through all other material bodies, and, in fact, forms a constituent part of them,—and especially so in the case of air and water,—I am fully prepared to recognise the æther combined with protoplasm and its resultants in vegetable organisms, as the instrument employed in vital processes. I regard this medium, whether existing in space or in solid bodies, as, beyond all others, the most wonderful form of matter of which we have any knowledge, and that not only the solar emanations, but electricity, magnetism, &c.,

are probably only diverse motions excited in it. If, then, we admit the hypothesis that this æther is a constituent element in all vegetation, living and dead, we should expect it to be highly susceptible and sensitive to the various motions which exist in the external medium, especially that which is transfused throughout the atmosphere in which they are immersed.

But still this æther is only a material instrument. It is not *mind*, nor can it be substituted for mind without contravening the essential distinction between mind and matter. I do not doubt that it is the proximate or secondary cause of a multitude of processes—vital, chemical, and mechanical—in vegetation. It may even be called, with still more propriety than protoplasm, the "physical basis of life." But it is only in itself a material creation, and requires *mind* to make use of it.

Once more:—Much stress is laid in modern scientific theories upon the fact that the "cause" of vegetable life is evidently an internal and not an external one. And this is paraded by some writers as a proof that the Divine Being cannot be regarded as the actual cause of vitality, because they are pleased to regard Him as exclusively *external* to the natural world, and speak of any such direct action upon matter as an "interference" with "inflexible law." The idea, however, which I hold in common with many of the acutest and profoundest thinkers of our own and past ages, is that the Deity is an ever-present and all-pervading Spirit, who works *in* rather than *upon* matter of every kind: though this conception is quite consistent with His being said to dwell in Heaven; for He is equally "our Father which is in Heaven," as well as everywhere else. He is as truly *in* all material things throughout His infinite dominions, as our spirits are within, and pervade every part of our bodies. This is not Bruno's Pantheism; it should rather be termed *Empante-theism*. At any rate, I believe it to be the simple truth, and, if fairly realised, would tend in no small degree to reconcile scientific conclusions with Christian doctrine and the plain teaching of Holy Scripture.

(To be continued.)

II. ATLANTIS AND LEMURIA: THE DISTRIBUTION OF LAND AND SEA.*

IT would seem as if every science, how rigorous soever in its methods and teachings, had yet some region where free scope is given to the imagination, and where research and romance seem to blend insensibly into each other. Astronomy has its doctrine of a central sun; physics is barely freed from the haunting presence of the perpetual motion; chemistry is seeking the decomposition of the elements, and biology craves to effect the origin of life from inorganic matter. Geology, physical geography,—if we may use so old-fashioned a term,—and mythology are the joint tenants of a "garden of phantasy," not of the future but of the past; to wit, the assumed islands, or even continents, which are said to have been swallowed up by the ocean. Of these supposed regions one, known as "Lemuria," is by some considered to have extended from Madagascar to Ceylon, or perhaps to Java; whilst another ideal continent which has received no name may, it is thought, have occupied the tropical portions of the Pacific, the scattered island-groups marking out its former mountain-chains. These two lands are not, we believe, the subjects of any popular tradition, nor do they figure in the works of poets and historians. They have been inferred, or at least assumed, by men of science in order to account for certain perplexing facts in the distribution of plants and animals.

Very different is the case with "lost Atlantis." In the days of classical antiquity the former existence of a large island or continent to the westward of Africa was a matter not merely of general belief, but it was referred to in a very decided manner by such writers as Plato, Theopompus, Plutarch, Herodotus, and Diodorus Siculus. All these authors speak of Atlantis as a very large, fruitful, and populous territory, whose inhabitants had come in contact with the nations of Europe and Africa, and had even attempted the subjugation of the eastern continent.

At first sight we are naturally disposed to regard these stories as distorted accounts of America, of whose existence some vague rumours had doubtless reached the so-called

* Oceans and Continents. By T. MELLARD READE, C.E., F.G.S., &c. London: Trübner and Co.

"old world." But to this interpretation there is a fatal objection. If we cross the Atlantic we find among the tribes of Central America corresponding traditions of an island to the *eastward* which had been suddenly overwhelmed and destroyed by an earthquake. This agreement of reports among nations who can scarcely be supposed to have come in contact seems to point to the former existence of a land intervening between Africa and America, and has, not unnaturally, made a deep impression upon the public mind. Further evidence of a confirmatory tendency was not wanting. The unnavigable character ascribed to the Atlantic in the days before the expedition of Columbus might be an exaggerated description of shoals and sand-banks remaining after the disappearance of the ill-fated island, and the present freedom of the ocean from such obstructions would at once follow from a continued subsidence of the area in question. The tract of densely-matted sea-weed westward from the Azores, which Columbus described as scarcely penetrable by his vessels, has been considered as a sort of buoy indicating the former position of this sunken land. The well-known volcanic character of the bed of the Atlantic from the coast of Portugal to the West Indies would afford every facility for the traditional catastrophe. It is further urged that, as shown by the soundings performed by the *Challenger* Expedition, a ridge of land extends from north to south along the middle of the Atlantic, over which the ocean is much shallower than on either side, rarely exceeding 1000 fathoms in depth, whilst on either hand are abysses twice and even three times deeper. There are, further, four places where the ridge rises above the sea level and appears as dry land, viz., the Azores, St. Paul's Rocks, Ascension, and Tristan da Cunha. An upward movement of about 6000 feet would therefore convert much of this ridge into dry land, whilst the islands just mentioned would then appear as lofty mountains.

So far, then, the story of "lost Atlantis" appears very plausible. But on closer examination not a few serious doubts cannot fail to suggest themselves to the enquirer. Let us turn first to the Greek traditions. Plato's account of Atlantis, as contained in his "Timæus," though tolerably circumstantial, is very indirect in its origin. Solon, during his visit to Egypt, is said to have learned certain particulars touching the position of Atlantis and the wars waged by its kings from a priest of Sais. Now, as Plato flourished two centuries after Solon, the first question is how had the tradition been handed down? Again, how had the story reached

Egypt? The rumour is, further, made to take a form flattering to the Greeks, and especially to the Athenians, by whose valour the great Atlantis invasion is said to have been repelled. But this invasion, if it occurred at all, must have taken place at an exceedingly early epoch. Otherwise a man like Solon would have undoubtedly heard of it at home. And it is evidently unlikely, to use the mildest term, that at such a remote time the power of Athens could have been sufficient to oppose an inroad designed for the conquest of Europe and Asia. The remaining Greek writers seem to have merely given echoes of the Platonic tradition.

It has also been pointed out that almost every nation bordering upon the ocean indulges in mythic accounts of the former extent of its territory, and of provinces or adjacent islands submerged in the ocean. As instances we may cite the legends of Lionness, stretching out to the west of Cornwall, or of "Aldland" to the west of Jutland.* Hence the coincidences of Greek and of Toltec tradition become of less value. The European dreamt of lost lands to the westward as did the Mexican to the eastward.

If we turn from human traditions to actually existing things we find facts difficult to reconcile with the existence of the hypothetical island. The Azores, with the exception of one small deposit of supposed Miocene age, in the islet of Santa Maria, are wholly volcanic, a very improbable feature if they had been the mountain-residue of a large island. The small miocene beds just mentioned likewise contradict the supposition that they might have been upheaved by volcanic action since the submergence of Atlantis. Had the Azores been the remnant of an extensive country their animal population would doubtless have exhibited corresponding features. In reality, however, they contain not a single snake, frog, or fresh-water fish, and only such mammals as have been introduced by human agency. The birds, insects, and land-shells, too, are evidently the descendants of stragglers, carried over by storms or currents from the nearest land, and having a strikingly European character. Of the eighteen species of resident land-birds found in the islands, all save three are common in Europe and North Africa. Hence the inference is forced upon us that the Azores are not surviving fragments of Atlantis.

We are thus brought to the threshold, so to speak, of a controversy that is now being carried on as to the permanence or the mutability of the general distribution of land and water on our globe. Have "the great continents and

* Journal of Science, 1876, p. 444.

great ocean basins occupied their present position through all geological time," as is maintained by Mr. A. R. Wallace, Mr. Murray of the *Challenger* Expedition, Professors Dana, Le Conte, and Agassiz; or has a complete change of land and sea taken place over and over again, as was held by Lyell and many of the elder geologists? This latter view has been very ably supported by Mr. Reade in the treatise now before us, and is strongly controverted by Mr. Wallace in his "Geographical Distribution of Animals," his "Australasia," and especially in his most recent work, "Island Life." Both authors seem agreed that "every foot of dry land has undoubtedly, at one time or other, formed part of a sea-bottom," but the converse proposition is not admitted. Mr. Reade argues that as "subaërial waste of land is the main source of the *detritus* of which the rocks are built, it follows that where the marine deposits were going on equivalent land must have existed somewhere," and that "the more we *limit* the area of the oscillation of land and sea, the more difficult the explanation of the phenomena of geology becomes."

Mr. Wallace, on the other hand, urges that the stratified rocks of our continents, consisting of sandstones, limestones, and conglomerates, must have been deposited in the shallow water within a comparatively short distance from the shore. He shows that the materials "denuded from the land and carried down as sediment by rivers are almost always confined within a distance of 50 to 100 miles of the coast, the finest mud only being carried 150 or rarely 200 miles." The deposits in mid-ocean consist mainly of "the shells of minute calcareous or siliceous organisms, with some decomposed pumice and volcanic dust." The deep-sea deposits differ in their chemical composition from any strata known to geologists, whilst the littoral accumulations approximate closely to chalk. Strata which had been formed in mid-sea would be characterised by the absence of vegetable remains. Yet if we go back from the miocene even to the palæozoic age we find embedded in the rocks the remains of plants and of animals peculiar to the land, to lakes, or to shallow seas. Further, as we have mentioned above in case of the Azores, the true oceanic islands, remote from the shores of the present continents, have not "preserved any fragments of the supposed ancient continents, nor of the deposits which must have resulted from their denudation during the whole period of their existence." Mr. Darwin contends* that had such continents existed, palæozoic and secondary formations

* Origin of Species, p. 288 (6th edition).

would in all probability have been accumulated from sediment derived from their wear and tear; and these would have been at least partially upheaved by the oscillations of level which must have intervened during these enormously long periods."

Mr. Reade, on the other hand, "is not prepared to admit that the rocks of the earth are all of littoral or shallow-water formation. He mentions that Professor A. Agassiz describes dredging up from over 1000 fathoms in the Gulf of Mexico masses of leaves, pieces of bamboo, of sugar-cane, dead land-shells, and other land-débris which would, if found fossil in rocks, be taken by geologists to indicate a shallow estuary surrounded by forests. It must be remembered, however, that these dredgings took place only fifteen miles from the shore.

Referring to the general flatness of the ocean-bed as another argument used against its ever having been land, he asks "what would Europe or any other continent look like if its configuration were traced only by soundings taken in, say, 3000 fathoms of water? Very probably the same argument would be used to prove that *it* had never been a continent." He considers it highly probable that on the mid-Atlantic ridge there exist submerged peaks of which we know nothing.

There is a consideration which seems at least to show that the main mass of water must for indefinitely long ages have existed in the southern, and the bulk of the dry land in the northern hemisphere; this is, that the now arctic regions appear to have been the original seat of terrestrial life, whilst the great southern ocean seems, according to the naturalists of the *Challenger*, to have been the first starting point of aquatic forms. Now if the bulk of the water had ever been transferred, according to the theory of Adhemar, from the southern to the northern hemisphere, either the proportion of dry land must have been very much reduced or great stretches of land must have existed in parts now covered with deep water.

On closer inspection of the two contending theories it will be found, we think, that a compromise may be effected in perfect harmony with the facts produced on both sides. It is on all hands conceded that every foot of the dry land now existing has been repeatedly submerged, whilst the vast excess of area of the ocean renders the counter-proposition unnecessary and improbable.* But the upholders of the general theory of the permanence of oceans and continents

* Mr. Reade merely argues that *almost* every part of the ocean-bed has been dry land.

make very large concessions. Thus Dr. W. B. Carpenter, in a lecture delivered not quite twelve months ago, considered it possible that a land-connection may have existed between Europe and America, whilst New Zealand, Tasmania, and South America may have been linked together by ridges of dry land, whilst Madagascar may have been similarly joined to Africa and even Asia. The evidence for "Atlantis" as situate between Africa and America did not seem to him satisfactory.

Here, then, we have an admission of the former existence not merely of Lemuria, but of a Pacific continent, though at a higher latitude than has been generally supposed. There could scarcely be a wider departure from the existing distribution of continents than a belt of land severing the Pacific from the Atlantic Ocean.

Mr. Wallace makes concessions somewhat similar, and if less extensive, much more judiciously defined. He thinks that during tertiary times Madagascar was "often probably much larger than it is now," and that to its north-east "there was once a series of very large islands, separated from it by not very wide straits; whilst eastward across the Indian Ocean we find the Chagos and Maldive coral atolls marking the position of other large islands, which together would form a line of communication by comparatively easy stages of 400 to 500 miles each between Madagascar and India."*

Thus, then, we have Lemuria recognised not indeed as a continent, but as an archipelago of large islands!

Turning to the regions of the Pacific we find that the same distinguished author considers New Zealand as having been anciently connected, whether by a continuous tract of land or by a chain of islands, with tropical Australia and New Guinea, "and perhaps at a still more recent epoch with the great southern continent."† Concerning Australia Mr. Wallace remarks also:—"During some portion of the Tertiary epoch Australia probably comprised much of its existing area together with Papua and the Solomon Islands, and perhaps extended as far east as the Fiji Islands, while it might also have had a considerable extension to the south and west."‡ Here, then, we have a goodly continent, largely encroaching upon what is now sea-bed, especially if, as is not improbable, the Moluccas and all land to the east of "Wallace's line" were in connection with Papua.

* Island Life, p. 386.
† *Ibidem*, p. 444.
‡ Geographical Distribution of Animals, i., p. 465.

Let us now see if anything similar can be done for or with "lost Atlantis," so as to reconcile ancient myths with recently discovered facts. Mr. Wallace concludes,—in concurrence with other authorities*—that no inconsiderable proportion of what is now the Gulf of Mexico and the Caribbean Sea was at one time taken up by land. This ancient region" not improbably occupied the space enclosed by uniting Western Cuba with Yucatan, and Jamaica with the Mosquito coast. This land must have stretched eastward to include Anguilla, and probably northward to include the whole of the Bahamas. At one time it perhaps extended southward so as to unite Haiti with Northern Venezuela." Was not this land, seen of course through a mythological medium, the lost Atlantis? True it is more than "some day's sail from Africa." But there is between Africa and the mainland of America no distinct evidence of any other region once existent but now submerged. The late Mr. Belt most decidedly held this opinion.† He suggests further that the Caribs, a warlike, fierce, and enterprising race, who even down to the time of Columbus made long voyages to ravage the villages of the pacific Nahuatls, were a likely people to have invaded the shores of the Mediterranean.

Thus, whilst fully admitting the general permanence of the position of continents and oceans, we see that there are shallows which very probably mark out former extensions of land, and which have disappeared owing to phenomena of subsidence not greater than have been elsewhere established with a tolerable approach to certainty. Whilst an examination of the depth of the seas and of the character of their bottoms indicates such connections as possible, peculiarities in the distribution of animal and vegetable life give almost irresistible proof of their former existence. But whether they were continuous stretches of land or groups of adjacent islands is a question upon which few men of science would venture to pronounce.

* Geographical Distribution of Animals, ii., p. 78.
† Naturalist in Nicaragua, pp. 270 and 365.

III. INDUSTRIAL TRAINING.

By An Old Technologist.

THIS subject is now, under two distinct points of view, drawing the attention of the general public. On the one hand, taking account of the steady growth of foreign competition* backed and fostered by protectionist laws, we ask what are our chances of making head against a number of rivals, all literally hungering and thirsting for the overthrow of our industrial prosperity? Superiority in every branch of manufactures has become for us a question almost of life and death, but many ugly facts seem to show that we have lost not a few of those attributes on which our old reputation was based.

Turning, on the other hand, in a direction apparently quite different, we find that a growing proportion of our people, especially of the rising generation, shrink from manual labour, and prefer the precarious and wretchedly paid career of the clerk to that of the artizan. These two elements of our national position have not escaped the notice of thoughtful men. Still, believing that the last word has not yet been said, I venture to offer a few observations on the subject.

I am far from supposing that the twin-evils which I have mentioned are solely due to any one agency. But among their many causes there is one which is deeply connected with both; I mean the nature of our industrial training, or the manner in which a practical knowledge and a mastery of any useful art has to be obtained. That manner or that process fails, on the one hand, to answer the purpose intended, and on the other hand it keeps aloof many who would otherwise be well fitted for an industrial career. I mean the system of apprenticeship, which has been handed down from the dark ages, and which, though corrupt in itself and quite out of harmony with the times, is recognised by the law, and is enforced by a power which is above the law. The leading features of this institution scarcely need mentioning. Even in its palmiest days it was objectionable, because the pupil was during the course of his training

* It is significant that a statesman of a modern type publicly expressed his pleasure that we had no longer the monopoly of the world's manufactures!

reduced to the position of a serf or a bondsman. The master might be unwilling or unable to teach fully and truly the "art and mystery" to be learnt. The apprentice might, on further experience, find that his own qualifications, bodily or mental, were ill-adapted for the business which he had selected. Yet the tie could only be broken, if at all, at great cost and trouble. Custom has blinded us to the impolicy as well as the injustice of these features, but what should we think of a college which no pupil could leave until his education was complete? A further drawback was the fixed term of years—generally the mystic number seven —imposed alike upon the industrious and idle, upon the lad of parts and the dullard.

In the lapse of ages, however, all the good features of the system have melted away, all the defects have remained and become increased, and certain fresh faults have sprung up. In the olden time the master, who was always personally and practically acquainted with his trade, did, as a rule, give the apprentice thorough instruction in every feature and point thereof. If the latter, from dulness or sloth, did not profit thereby, the fault and the loss were his own. Again, in most of the cities of Europe, the young craftsman when "out of his time" underwent a kind of test examination before experienced members of the guild. If he was found incompetent, the mere fact of his having gone through the form of apprenticeship did not entitle him to set up in business as a master. The long term of years was also not without its justification. The master contracted to board, lodge, and clothe the apprentice, and as the fee—when one was paid at all—was moderate, equity required that he should have the benefit of the services of the latter for some time after they had become valuable. Such was apprenticeship in the days of yore—an institution far from faultless, but perhaps the best that could in those days be carried out, and deserving credit for having trained generation after generation of thorough workmen who took a pride in the quality of their handiwork.

The causes which led to the entire corruption of the system have been fully shown elsewhere, and I will therefore pass at once to its present state. Of its main features there survive merely the legal binding for a fixed term of years, the state of serfdom, and the initial fee, which often reaches to a heavy sum. The personal supervision and instruction on the part of the master have entirely ceased; the youth is turned loose into the workshop, and may, if he is sharp enough, pick up more or less of the details of the

trade. But no one feels personally responsible for his thorough training. Managers, foremen, experienced workmen, *even if willing*, have not time to give him the necessary instructions. And too often they are not even willing. If they are in possession of any especial trade-secret they will not communicate it. It generally happens that in every branch of trade there are certain departments easier than the rest. The apprentice, instead of acquiring a complete knowledge of the whole business, is kept almost exclusively to these easy branches. I have known cases where young men have thus been completely mistrained, and on reaching the end of their term have found that they had their work to begin again.

The moral supervision of the old times has also disappeared no less completely than the industrial guidance, and has given place to systematic initiation in wrong-doing. Among the earliest tasks imposed upon an apprentice in many establishments are to fetch beer or spirits into the workshops contrary to orders, or to watch lest the men are surprised by the manager, when engaged in some piece of peculation, or doing work on their own account with the master's materials. A lesson never omitted in certain trades is to instil into the novice the necessity of wasting the greatest possible amount of time over every job. If a youth finds these and similar pieces of dishonesty repugnant to his principles he is made to feel his serfdom in a variety of manners.

Another feature of old apprenticeship which has been blotted out is the final test of skill and proficiency. All persons who have regularly "served their time" are—in the spirit of British Trades-Unionism—considered equal, and any master who should "call a spade a spade" to the extent of pronouncing an idler or a dolt incompetent would have to bear the consequences. Thus it may be said that modern apprenticeship utterly fails to do what it professes. To say the best of it, it is an initiatory farce which every youth must undergo before he can be allowed to learn a trade in earnest, at the grievous sacrifice of time, money, and moral principle.

I may now ask, who are the parties injured by the apprenticeship system as it now exists? The list is long and formidable. The *boná fide* manufacturer (in contradistinction to a class whom I may treat of below) is the first sufferer. He wants skilful, competent workmen, who feel some little pride in their work, and are not always trying how idle, careless, and wasteful they may be without the risk of

dismissal. Such men he can rarely meet with. One of the first lessons which a youth learns on entering the workshop is that merit and demerit are paid at the same rate. He even finds that to excel either in the quantity or quality of his performances is to incur the active ill-will of many of his shopmates. To get through more than a certain amount of work in a given time is considered as a declaration of war against the slothful and the thoughtless. This formal organisation of inefficiency is not merely hurtful to the employer. It tells upon the consumer, who gets inferior articles for his money. It militates against our foreign trade: if purchasers abroad find in every article of British make the stamp of carelessness and inferior workmanship, can we blame them if they send their orders henceforth to France, Germany, America?

Not less deadly is the system to the really clever, industrious, and conscientious workman. He is, according to our modern practice, a mere eyesore and a nuisance to his worthless companions. His very existence is a silent protest against their omissions and commissions.

But the heaviest, the most capital charge against apprenticeship, is that it divides the working classes (in the common acceptation of the term) into two sections, separated by an almost impassable boundary, allowing to the majority no prospect of rise according to merit, and consequently depriving them of all motive for exertion.

In many establishments there exist a small body of skilled hands—foremen over branches, &c.—and a large number of mere labourers. This is decidedly the case in the chemical and tinctorial establishments which the writer has had the greatest opportunity of observing. Between these two classes there exists a gulf fully as wide as that which formerly, in the British army, separated the "officer and gentleman" from the mere private. Just as the officer held his superior position in virtue of purchase-money, so the foreman holds his rank and pay by reason of an apprenticeship premium. If he is attentive, steady, skilful, he may rise to be a manager, or at any rate his salary is sure to be increased. But for the labourer—the "slab," or "mule," as he is called—there is, under ordinary circumstances, no chance of promotion. Suppose that a labourer in a dye-works, by dint of care and attention, became as good a dyer as the foreman of his department, and could turn out, *e.g.*, Turkey-reds unequalled in fire and fastness, would he ever be entrusted with the conduct of that department? Scarcely: it would be said, as it has been said

times without end, "Oh, yes, he is a very useful sort of man in his way, but he has never served his time." This magical formula decides the question. It is scarcely in human nature for a man to aim at excellence when once he knows that his exertions will never command recognition. The consequence is that the labourer takes not a particle of interest in his work, goes mechanically through his round of duties, and obeys the foreman's orders literally. He has no interest in preventing waste or neglect; he cares not a straw for any mischief that takes place, so long as he cannot be held personally responsible, and, as a matter of course, shuts his eyes to all those occasional incidents from which an earnest and thoughtful man might take hints for improvements and inventions. To me it seems exceedingly sad that a large number of the men employed in any of the arts or manufactures should be in such a position,—sad for themselves, sad for their employers, saddest in the end for the nation. Should not the motto of the first Napoleon, "A free career for talent," hold good in the workshop as decidedly as in the camp?

But we may turn to other trades. Among mechanical engineers there are also the two distinct classes; the skilled workmen, who have duly served their time, and the labourers. I could point out a certain establishment of this kind, not 100 miles from Manchester, where there was a labourer by common consent the cleverest man in the yard. If there was any piece of work of exceptional delicacy and difficulty it was placed in his hands. To all this the aristocracy of the trade graciously consented; but he might receive only a labourer's wages. The firm would have been only too glad to encourage him, and secure his services by paying him as a skilled mechanic. Had they made the attempt, however, it would have been voted treason against the sacred rights of apprenticeship, and a "strike" would have been at once declared. It may be asked whether, by thus crushing native talent, we do not fearfully handicap ourselves in our rivalry with foreign nations. Unless I am completely misinformed American manufacturers do not care one straw when, where, or how a clever workman has acquired his skill. The American workman, too, seeks to rise in the world rather by bringing out some useful invention than by enforcing such old-traditional distinctions in the workshop. Such, then, is the influence of apprenticeship upon the artizan.

There is yet a further count in the indictment. The spirit of apprenticeship, in modern times, is one of inveterate opposition to improvement. The inventor, if he can gain a

fair hearing from the capitalist, is at once scouted by the British workman on the plea that, never having "served his time," he is a mere ignorant outsider, and that anything he proposes may, or rather should be, set aside without further scrutiny. It is a great mistake to imagine that "red tape" is confined to governmental or municipal bodies. There is not often found a manufactory without its small "circumlocution" department, and if the proprietor does not indulge in this feature his men rarely fail to make up for the deficiency.

Lastly, but not least, apprenticeship is the true reason why the sons of the poorer middle-class families prefer the semi-starvation of a clerkship to the higher emoluments of the artizan. It is quite a mistake to imagine, as is done by some hasty observers, that this preference is due to any abstract contempt for manual labour or love for "gentility." There is a more tangible hindrance. There is the burden of the premium to be paid down at once, often before it can be ascertained whether the master is really a person to whom the guidance and control of a youth can fitly be entrusted. Above all there is the state of serfdom, not merely in relation to the master, but to every rough about the place who is "out of his time." What this serfdom means to a youth who has been brought up with habits of decency and ideas of self-respect, it would take an abler writer than I am to picture. Suffice it to say that to the average "British workman" (I fear it might be said to the English mind altogether) there is no being so incomprehensible and ridiculous as a poor gentleman. The Spaniard, the Frenchman, the German—I may add the Scot and the Irishman—can appreciate refinement, courtesy, high-mindedness in any position. We are unable to do so, unless to these attributes is added the power to fling shillings to every man who says "It is a dry day." Then, indeed, we touch our caps, and say "That's a real gentleman!" Does the reader now understand why the sons, *e.g.*, of struggling professional men, of "younger sons of younger brothers," and of all whose culture is higher than their means, are compelled to hold aloof from the trades, and must remain so until the guardian imp "apprenticeship" is exorcised?

It may, however, be asked, if apprenticeship is so decidedly hurtful, how does it happen that its formal abolition has not long ago been effected? I answer that the case is very similar to that of our defective patent-law system. The evils are manifold and serious, but they do not lie on the surface. The whole affair, moreover, is one of a plain,

practical character, giving little scope for sensational eloquence, and not fitting into the programme of either of the great political parties. Moreover, the apprenticeship system, with all its failings thick upon it, plays into the hands of two classes, who will most strenuously oppose its reform, or rather its abolition. There are a certain class of employers, both in the productive and in the distributive groups of businesses, who subsist to a great extent upon apprenticeship premiums. Having little real business, little experience, and often little skill, they have not the opportunity to "well and truly teach the craft of" —— to the unfortunate youths whose parents are gulled by their advertisements. In such cases the affair is an empty form, and nothing more. The victim, when his term is out, or rather long before, makes the discovery that his time and money have been spent for nothing. Lawyers will of course remind me that there is a "remedy" for all this, and that damages may be recovered from a master who has not duly instructed his apprentice. This is perfectly true; but what damages can bring back five or seven years wasted at the most critical part of a young man's life? "Premiums" simply enable dishonourable tradesmen not merely to get their work done for nothing, but to be paid for letting some one do it! When the indentures are expired the injured youth is quietly dismissed, and a fresh gudgeon is ensnared in his place. Is it likely that the class who profit so largely by this iniquitous system will be anxious for its reform?

Perhaps a still more obstinate resistance may be expected from the workmen. As a rule, where apprenticeship is most general, trades'-unionism and its interference between capitalist and workmen are most rampant. Throw open a trade to the world, and it will be no longer possible to maintain that law which decrees that the bad workman or the idler shall be as highly paid as the clever and the industrious, and which compels the able to lower themselves to the standard of the most incompetent. It has even been said that to abolish apprenticeship would be to draw the poison-fangs of the unions, thus annulling their power for evil.

It must not for a moment be supposed that I think that a practical training in any art or manufacture can be dispensed with. On the contrary, I would demand in this respect increased thoroughness and a final practical (not verbal) test, without which no person should be competent to exercise the calling in question. But it should be open to any person, no matter how and where he had acquired his knowledge, to come forward and offer himself as a candidate for

the test. All "binding" for any term I would absolutely prohibit. Any member of a trade who had himself passed the test should—on giving proof that he possessed the needful facilities—be licensed to receive pupils for practical instruction. Such pupils should pay as is done in colleges, *i.e.*, not a "premium" or lump sum down, but a quarterly or yearly fee, and should be at liberty to go to another instructor or to another business if either were found, on further acquaintance, to be unsuitable.

Whether this practical training in the workshop should precede or follow a study of the principles of the art or manufacture in one of those colleges which it is hoped will spring up in all our large towns, I would not venture to decide.

IV. COMPARATIVE PSYCHOLOGY.*

ENGLISH literature, from the times of Gilbert White downwards, has been rich in original observations on the habits, the propensities, and the intelligence of the lower animals. Yet until very recently how little have we, as a nation, contributed towards a definite science of the "brute" mind. This poverty is mainly due to the circumstance that we, more persistently than our neighbours, have been intent to go on treating the animal soul and the human soul as two absolutely distinct essences between which no relations of co-filiation or even of similarity are allowed to exist. The general public, including the men of "culture" and "scholarship" as well as the rude and ignorant, assumes that the doings of beasts, of birds, or of insects, are governed by "instinct," *i.e.*, by impulses having their direct origin in the will of the Creator, under the guidance of which each "brute" blindly and almost unconsciously plays its part in the great tragedy of life. It will be granted that such a theory as commonly understood renders observation needless, and any attempt to explain and harmonise facts a mere impertinence. It might, however, possibly have struck the upholders of this doctrine—*un*natu-

* Der Thierische Wille. Von G. H. SCHNEIDER. Leipzig: Ambrose Abel.

ralists, if we may so term them—that even the direct immediate action of the Infinite Wisdom will not be aimless and capricious, but will be based upon definite principles which man may legitimately study and seek to comprehend. Thus to think and to act was not the good pleasure of the "Instinctarian" school. In as far as they condescended to search into animal conduct, will, affection, they strove to bring phenomena into agreement with their preconceived notions of the Divine purposes. Professing to wonder at the goodness and the wisdom of God as displayed in animal life, they rather admired their own cleverness in detecting or inventing cases of contrivance. It may be remembered that a sage of this class fancied he saw the foot of a bee perforated with tiny holes, and immediately pointed out this imaginary feature as a special design for enabling the insect to sift the pollen of flowers!

But even this theory of "instinct" as directly implanted by God might have been turned to good use. Had men tried how far it would account for facts it would at least have given definite direction to observation, just, for instance, as did the doctrine of phlogiston. It would sooner or later have been perceived that animals ocasionally commit serious errors, even in actions essential to the preservation of the individual species. Such instances were put on record by White, though he does not draw the obvious inference that a mistaken "instinct" cannot have its source in Divine inspiration.

Another class, generally naturalists without any philosophical training, have carefully studied the habits of animals, but at haphazard, without any theory at all. This procedure is no less faulty than the setting out with some vague assumption incapable alike of being verified or refuted by an appeal to facts. Too many of our English ornithologists, entomologists, &c., have acted in this manner, and in consequence their researches have not the character of a definite and purposive questioning of nature.

Then, again, there have been speculations put forward by philosophers who made no attempt at observation or experiment. These men evolved out of their own consciousness certain notions concerning animal will and intelligence. Thus, Descartes considered beasts as pure automata, capable of feeling, but unconscious—a hypothesis which scarcely differs from that of the Instinctarians, and which points significantly in the direction of the "unconscious clairvoyance" of Prof. von Hartmann, and of the "unconscious cerebration" of Dr. Carpenter. It is scarcely needful to say that none of

these hypotheses—if we may so call them—throw any light upon the phenomena to be dealt with. We may refer to "unconscious cerebration" the action of the violinist who plays a passage of music and at the same time thinks of something totally different, but not that of the mason-bee who makes and provisions a cell for the offspring she is never to see. We know that with the violinist the production of every note has been the subject of separate and conscious effort, which with increasing practice have become unnecessary. Now in the case of the insect the unconscious action is supposed not to have grown out of any antecedent conscious state. The two phenomena are radically distinct.

On the other hand, Buffon ascribes to the lower animals feeling and consciousness, but not memory, whilst Reaumur and Condillac—the former an observer, the latter not—ascribed their actions to self-conscious purpose, an error which we shall estimate the better if we reflect how great a part of human conduct takes place without any knowledge of its final purpose.

But it is not merely animal psychology which is in an unsatisfactory state. The science of the human mind has by no means reached the position which it ought to have done. In each case the cause of this imperfection is the same: the failure to recognise the fundamental unity of psychic phenomena in man and in beast; the attempt to study facts torn out of connection with the whole to which they belong. We shall make solid and satisfactory progress when, and only when, we set out with the simplest manifestations of feeling and of will in the lowest animals and trace their gradual development up to man. It has long been found that a philosophic study of the structure of the human body is impossible if we repudiate general—or, as it is commonly called, "comparative"—morphology; it is no less certain that the functions of our organs, digestion, assimilation, respiration, and the like, form merely a special province of the physiology of the whole animal kingdom. With the phenomena of mind it is not otherwise. This method of attacking the question is equally essential whether the student considers mind as an immaterial entity superadded to the body of man and beast, or whether with a body of thinkers who, as we must confess are increasing, he looks upon it as a function or property of a "certain chemical compound." The only inquirers to whom comparative physchology is useless, or rather impossible, are those not over-consistent thinkers who, whilst regarding man as a spiritual being, pronounce the

lower animals purely material, a position overloaded with difficulties.

If, then, we believe in the dictum, so often flung reproachfully at men of science, that "the proper study of mankind is man," we must not disdain to begin this study with its very alphabet. For want of such modest and discreet proceeding we have hitherto made much more haste than good speed.

We are mainly led to these considerations by the appearance of a work which will, we believe, mark out a turning-point in the career of animal psychology. The author takes his departure not from a survey of intelligence, but of the will, as the more fundamental faculty. Says he :—"Whether the soul has its seat in the pineal gland or somewhere else; what is the relation between the inner and the outer sense; whether we have any *a priori* ideas; whether things *per se* differ from our perception of them, are questions on which thick volumes have been written and to which a great number of good thinkers have consecrated their existence. But we are only faintly beginning to reflect on the development of the universal motives which have given rise to all intellectual existence."

What are these universal motives, impulses, or, if we please, instincts? Cynical as it may sound to the hasty and the thoughtless, they are, in their origin, simply visceral. All instinctive impulses and all conscious expressions of will subserve either the preservation of the life of the individual or the production and nurture of its offspring. Self-preservation is effected by the acquisition of food, and by defensive precautions and stratagems; the care for the preservation of the species resolves itself into sexual attraction and parental duties, and to these four fundamental principles all the manifold expressions of animal and human will may be reduced. But the nutritive impulse, the craving for food, is the root of all animal instincts, for without food safety is neither possible nor even useful, and reproduction impracticable.* Hunger, therefore, Dr. Schneider maintains, is "the ultimate motive power of all activity and spiritual development."

Can this contention be true? If we look at man as now existing we find that a very large proportion of his activity does not bear even indirectly upon the preservation of the individual or the species, and has, indeed, no material object

* "Sine Baccho et Cerere alget Venus."

at all. Nay, as the highest kinds of exertion, including the discovery and establishment of scientific truth, is not remunerative, we may say that hunger is here a check, not a stimulus. It has often been said that our progress in discovery would be far more rapid if we could train up a caste of thinkers who could dispense with the common necessaries of life. But we are bound to admit that the highest brutes and even the human savage show scant marks of such disinterested and spontaneous activity. The "black-fellow" of Australia, like the cat or the dog when not under the influence of hunger, of fear, or of the reproductive appetite, sleeps or sits idle and objectless. Hence it must be said that if man was placed upon the earth as an intelligent being, Dr. Schneider's fundamental view is false; if, however, our species has gradually been evolved from a lower form of animal life, or even from a state of savagery it is true. At the same time we add "pity 't is 't is true."

As the next step the author divides all animal impulses or "instincts" into four classes: impulses of sensation, perception, conception, and of thought. In the lowest beings the instincts of sensation, excited by touch—by actual contact with some external object—are alone to be traced. In higher forms of life "perceptive" feelings are superadded, by which the author understands such as are produced by distinguishing objects at a distance. Hence they cannot appear until the organs of smell, hearing, and sight have begun to be differentiated. Zoophytes, worms, the lower mollusca, advance to or shrink from an object, only accordding as, on touching it, they experience an agreeable sensation or otherwise. In insects, fishes, birds, and mammalia, the perceptive feelings come into play. Objects desirable for food, individuals of the opposite sex, and, on the other hand, enemies, are recognised at a distance, and the animal in question, without any reflection or idea of an ultimate purpose, acts accordingly. It will be asked why outward objects whether immediately felt, or distinguished afar off, should make a pleasant or unpleasant impression upon any animal? The answer must be sought in the facts of heredity. We—for the perceptive feelings extend up to man—and our semi-human forefathers* have gradually accustomed ourselves to feed upon certain objects, and to avoid others in consequence of their offensive taste or hurtful effects. In consequence the child, as soon as its senses are sufficiently developed, but not before, seizes and eats bodies of the one

* Always supposing that man has been evolved from some lower animal.

class and rejects those of the other—all this without any play of thought, but quite instinctively. The anger of the bull or the turkey-cock at the sight of a red cloth proves how spontaneous and unreflecting are the aversions of animals.

But not merely the touch or the sight of an object may excite feeling and lead to action; the conception or idea of anything agreeable or disagreeable even in its entire absence produces the same effects in the higher animals and in man. As an instance of such conceptive feelings the author mentions the dread of darkness, of thick woods, and of unexplored caverns, which is now innate in man. This feeling is due to the hereditary conception of dangerous wild beasts, which may approach us unseen in the night, or may lurk in caves and thickets. Hence a vague fear is experienced even where no beasts of prey exist.

Thought-feelings, lastly, are indirect conceptive feelings, and predominate only in man. Hence the author even proposes a zoological classification in which the protozoa, radiata, and most of the mollusca figure as sensation-animals; the cephalopods and the annulosa as perception-animals; the vertebrates, with the exception of man, as conception animals; and man alone as the thought animal. We cannot pronounce this arrangement happy.

The author points out, as the distinction between his position and that of Von Hartmann, that the latter fails to understand how simply instincts may be explained by the inheritance of certain feelings and impulses. He asks "would it not be *piquant* to refer instinct to the fourth dimension which haunts Zöllner's brain? Whosoever makes this attempt will certainly find readers."

Perhaps the fairest method of deciding on the value of Dr. Schneider's speculations will be to examine their application to certain admitted difficulties in connection with animal intelligence. It has often been asked why a female butterfly deposits her eggs only on such plants which will afford suitable nourishment for the young caterpillars? The reply is that the sight, the odour, and ultimately the feeling of the proper plant, stimulate her to deposit her ova, whilst if she settles on another plant she experiences no such sensation. It is well-known that the actual laying of an egg depends very much upon the choice of the mother, even in birds. A hen will lay her egg where she sees another egg, or an object closely resembling it in shape, size, and colour. Where she finds no such nest-egg she will roam about as long as possible without laying. In like manner a "painted

lady" butterfly is pleasantly impressed on meeting with a bed of thistles, and attaches her eggs to the leaves. Why she should be thus pleasantly affected on meeting with a thistle we can readily understand if we remember that she and her ancestors have for unknown ages fed upon this plant. That the pupa-state involves complete oblivion of all impressions dating from the larval condition is pure assumption. But these considerations by no means imply that the female butterfly deliberately and consciously selects this or the other plant from the formal conviction that it, and it only, will afford a suitable nourishment for the young brood. The female blow-fly is in like manner led to lay her eggs by a perceptive feeling excited by the smell of putrescible animal matter. How little reason or Divine guidance is concerned in the action appears from the fact that she will likewise lay her eggs on certain flowers which give off a carrion-like odour, when of course the young maggots perish from hunger.

Why, again, do birds always select the most suitable material for their nests, and in general such as cannot readily be distinguished from surrounding objects? Not in consequence of a deliberate selection, but because the perception of this material and of no other is in them part and parcel of the building impulse. The perception of the empty nest or of a single egg is in birds so closely connected with the physiological function of the development of eggs that the former induces, or at least stimulates, the latter, whilst the perception of a sufficient number has the contrary effect. Wild ducks even steal each other's eggs, and some birds will even seat themselves upon the nests of others—a clear proof that the sight of eggs awakes in them a desire to hatch, and that birds sit because it affords them pleasure.

The migration of birds likewise requires no unconscious clairvoyance for its explanation. Natural selection is to some extent here concerned. Those individuals which do not depart in autumn perish, and the species is perpetuated by those only which feel the wandering impulse at the right time. Old birds which have already travelled from Europe to Africa, and have become accustomed to connect want or abundance with certain states of the atmosphere, are urged by conceptive feelings to take their departure. All the phenomena of autumn suggests to them migration just as the sight of eggs arouses the impulse to hatch. Their senses and their intelligence are sufficiently developed to instruct them in what quarter to seek for warmth. In finding their way they have advantages which we men often forget.

Hence migration may be regarded as a complicated result of natural selection, heredity, and perceptive and conceptive impulse. It must also be remembered that birds often set out too early or too late, and consequently suffer; and that multitudes evidently fail to find their way back to their original home, as may be gathered from the want of increase in their numbers.

An interesting fact is cited to prove that birds are formally educated by their parents. Young crossbills are supplied at first with pine-cones which are fully opened, then with half-opened ones, and finally with such as are closed, and are thus gradually trained in the art of finding and picking out the seeds.

The author's explanation of slave-holding among ants does not appear to us satisfactory. He refers this custom to mere perceptive impulse. The plunderers carry strange pupæ into their nests from a mere perceptive impulse, just as a bird will steal the eggs of other birds to sit upon. That the ants thus born in a strange city remain there and work in their accustomed manner need not surprise us.

We think that Dr. Schneider here overlooks the fact that the slave-ants occupy a manifestly distinct and subordinate position, and when dead are treated with less ceremony than the free citizens. It would be very important to make fresh observations on slave-making ants from this point of view.

The further question why any animal should like those things which are favourable to the preservation of the individual or the species, and should shun all that are hostile, scarcely needs answering. Suppose any creature had an especial liking for poisonous food: it must necessarily perish, as multitudes no doubt have done, those only surviving whose taste were in better harmony with the conditions of existence.

Dr. Schneider, whilst tracing many of the habits of animals to direct unconscious perceptive impulses, does not fall into the common error of claiming thought as an attribute of man alone. He gives on good authority instances of complicated action on the part of several of the higher animals, involving formal, conscious contrivance and a calculation as to what a man or other animal would be likely to do under such circumstances. He considers, however, that man only acts on fixed principles. An entire number of the "Journal of Science" would not suffice for the most superficial discussion of half the interesting considerations here brought forward. But the only really appropriate criticism of the work must be conducted in the

woods, or at the aquarium and vivarium, so as to bring the author's views to the test of actual facts. We have not often met with a book of equal value for pointing out to the thoughtful naturalist questions for experimental decision.

That there is here much which we cannot personally approve of is a very secondary point. We scarcely think that the strictures upon Dr. Dohrn, of the Naples aquarium, are justifiable. The author seems to us, further, to go out of his way to sneer at Professor Zöllner and the spiritualist school, with whom he, as belonging to the Hæckelian, or extreme left wing of the Evolutionist army, he has no sympathy. There is also a somewhat gratuitous introduction of the Jewish question, on which Germany is greatly exercised. We hope, however, that this is not the last work of Dr. Schneider's which we may have the pleasure of studying.

V. THE MATERIALISTIC ORIGIN OF THE SEXES.

By Andrew Dewar,
Author of "Origin of Creation."

MATERIALISM is yet in its infancy. Born of human learning, weaned in scientific research, and cradled in the toleration of an enlightened civilisation, its advent marks an epoch in the history of humanity. Should there be fearful shadows in its progress, where loiter grim doubts and gloomy forebodings, these are only consequent to its youth, and the necessary result of the light from a sun whose slanting rays only reach us. But even as the noonday sun chases away the shadows in its splendour, so we are assured that no doctrine in these enlightened days will ever be accepted which does not in its maturity shine on the human race for true knowledge and good.

"All knowledge is our province" said Bacon, and we would be less than men if any phenomenon in nature was considered inscrutable by us, the highest outcome of Nature. Thinking thus, one of the most curious problems is that of the sexes; and the value of the doctrine of Materialism is

apparent when we come to question its cause, for no natural law professes even to offer an hypothesis on the subject.

It may here be asked, what is the doctrine of Materialism? As enunciated by the most advanced physicists, it is that "Matter contains within itself the promise and potency of every form and quality of life." This, it will be correctly said, is only a statement, not a *cause*,—an assumption that requires proof, not a proposition of fact which may be demonstrated with the facility of a problem in Euclid. Granted; but it will be admitted that if we can show how the sexes originate from matter and its inherent properties, Materialism must be more than an assertion. This without further introduction we now propose to discuss.

Taking matter and its properties as the only foundation we can build on with safety, we ask What is Matter?

After long years of experiment and failure we answer this question with a firm assurance in several things:—

First. The Indestructibility of Matter. This involves both the eternity of matter and the eternity of the properties of matter. Nothing exists outside of matter. Nothing but matter and its properties exist. Nothing can be taken from matter, nothing can be added to it. Whatever properties matter may have had, matter must have now; and, *vice versâ*, whatever properties matter has now, matter has always had.

Secondly. Matter is composed of elements of which sixty-four are known. Everything consists of those elements, their combinations, changes, and properties. Whatever form they take now, under similar circumstances they would either in the past or future also assume.

This is the foundation of Materialism, and so far as it goes is perfectly clear and logical. Presuming that no force exists outside of matter, the *properties of matter* must account for every phenomenon in matter, and should they fail the premises fail also, and the fact is made certain that a force exists outside of matter, and ergo that Materialism is dead.

What, then, are the properties of Matter?

Here there is confusion and disagreement. Gravitation, cohesion, and chemical attraction are the three forces which have been popularly supposed to control matter; but when Huxley pertinently asked what these forces were, he found them not forces at all, but mere names or effects of a cause or causes unknown. Even Evolution, from which so much was expected and preached, has fallen into disgrace, and proved to be no force or cause either, but merely an "orderly sequence of phenomena" from some cause or causes unknown. How are we, then, to discover those unknown

causes? If Materialism is true, they must exist; but Materialism cannot be maintained as a doctrine until we show that they do exist and what they are.

We are thus led back to our premises again,—to matter and the elements,—and we say, according to materialistic doctrine, if sex exists in matter now, sex must always have existed. Consequently, if matter was once a sheer chaos, or, as the most daring of physicists assert, a universal fire-mist, then sex in some form or another existed in that chaos or in that mist. As, assuredly, it did not exist in the form of any kind of life we are acquainted with, we are led to ask *if matter does not contain within itself some inherent sexual or dual qualities.* If it does, Materialism is alive; if not, Materialism is dead.

Matter is composed of sixty-four elements, more or less: are these elements all alike in kind, or can we trace a sex or duality in them? Fortunately for our doctrine we can. Although stated by eminent chemists to be of no importance, and made "solely for the sake of simplicity," the elements have long been divided into metallic and non-metallic classes. All the elements belong either to one class or the other. So far success seems to favour us. Doubt is the mainspring of progress, and this doubting of a fact which has long been maintained to be of *no importance* may be the key to open up unknown vistas of research.

It will, however, be conceded in a matter of no importance that this dual classification may be incorrect. This we believe to be the case, for one very important element—hydrogen—is given in every classification among the non-metallic elements, while the element itself is admitted to be metallic; a strange and incomprehensible misplacement. Whether the others are right or not only extensive experiments will determine. With this rectification, however, they are so far correct that the movements of Nature are opened to us as by a miracle. The lock cleared of this obstruction opens readily to the key, and Materialism rules triumphant. We seem premature; how does the duality of the elements solve all mysteries?

The object of this paper was to prove the materialistic origin of the sexes—that sex had its origin in matter. That matter is dual is part confirmation of it, but, like its antitype, we must also prove dual matter to be productive. Two females will not produce, neither will two males. If a production can be formed from the non-metallic elements only, or metallic only, then our theory is false; production should only ensue from the connection or inter-

action of opposite sexes and elements. Chemical analysis in this particular shows that we are right. *No natural production can be found containing the elements of only one class;* both metallic and non-metallic are essential to a formation. In simple laboratory experiments the opposite elements will combine readily with one another, while combination cannot be produced among the elements of either class alone. Even the simplest natural productions, such as air and water, are of dual combinations. Air composed o oxygen, nitrogen, carbonic acid gas, *hydrogen*, &c. Water, composed of oxygen and *hydrogen*, is the great medium also of life and production. Even the old *element*, fire or combustion, can only be produced from oxygen and *hydrogen*, with other opposing dual elements. All rock formations, crystals, stratas, are produced from combinations of the dual elements. All plants and vegetation are of dual formation and dual in sex, while all animals are undoubtedly male and female.

Our premises being thus clear and true regarding the elements of matter, it follows that—as all plants and animals are composed of the same elements, of oxygen, hydrogen, &c., in different proportions and combinations—the conclusion we have been seeking is inevitable, namely, *sex in either animal or vegetable life is derived from and had its origin in the duality of matter.*

What causes dual matter to combine and be productive would lead us into another enquiry as to the origin of life from matter; but this we reserve for future consideration.

ANALYSES OF BOOKS.

Ponds and Ditches. By M. C. Cooke, M.A., LL.D., A.L.S. 254 pp., 12mo. London: Society for Promoting Christian Knowledge.

This little book forms one of a series of "Natural History Rambles." The increased interest felt in all natural history subjects has caused a demand for a class of works giving instruction to those for whom a student's manual would be unsuitable. Such a book is always difficult to write in a satisfactory manner, needing perhaps as thorough aquaintance with a subject as is required for a work of far greater pretensions.

Dr. Cooke has succeeded in writing in a popular and pleasing manner, and yet without in any way sacrificing the interests of science. The first fourteen chapters are equally divided between plants and animals, the fifteenth is devoted to the subjects of collecting and examining. The headings are—Still Waters, Flowering Plants, Plants Without Flowers, Fresh-water Algæ, Desmids, Diatoms, Low-life (Protozoa), Hydras, Fresh-water Polyzoa, Rotifers, Leeches and Worms, Spiders, Mites and Water Bears, Water-fleas, Aquatic Larvæ, and Collecting and Examining. Attention is directed principally to those objects which are likely to be most commonly met with; good figures are given which will aid greatly in the recognition of the various forms of vegetable and animal life.

Those who have had the good fortune to meet the author at one of the excursions of the Quekett Club will recognise his happy style of making himself at home with those who know little or nothing, and leaving them possessed of a considerable amount of practical information. The matter of the very interesting conversations in the field or at the tea-table after the excursion and a good deal more has here been reproduced.

The book is a pleasant one to read, the references to places where fuller details may be obtained are abundant; much information is given relating to obscure plants and animals, such as the algæ, the worms and rotifers, which would have to be searched for through the pages of many books and periodical publications. The book is not only one in every way suitable for beginners, but may be read with profit by those somewhat more advanced in microscopical studies.

Siberia in Europe. A Visit to the Valley of the Petchora in North East Russia; with Descriptions of the Natural History, Migration of Birds, &c. By H. SEEBOHM, F.L.S., F.G.S., F.R.G.S. London: John Murray.

WE have here the narrative of an ornithological tour undertaken in 1875 by the author and his friend J. A. Harvie Brown, to a very scantily known region. Though situate within the Arctic circle the valley of the Petchora offers an interesting field of observation for the naturalist. There were half a dozen species of birds known to visit England whose breeding grounds were a mystery. Of three of these, viz., the grey plover, the little stint, and Bewick's swan, our travellers succeeded in bringing home identified eggs. Two of the remaining, the sanderling and the knot, were found breeding in lat. 82° N., by Captain Fielder, of the Nares Arctic Expedition, and one alone, the curlew sandpiper, is left as a problem for future explorers in the far north. Messrs. Seebohm and Harvie Brown have further added several species of birds to the European fauna, such as the Siberian chiffchaff, the Petchora pipit, the Siberian herring-gull, the Arctic forms of the marsh-tit, and the lesser spotted wood-pecker, the yellow-headed wagtail, and the Asiatic stonechat. The unity of the Palæarctic region is thus confirmed and the arguments in favour of a zoo-geographical separation of Europe from Asia proportionately weakened. But the Author concludes that "as far as the Polar regions are concerned the division into Nearctic and Palæarctic is a purely arbitrary one." Of the 110 species which he obtained 32 breed both in the eastern and western hemispheres. About 17 more belong especially to the eastern polar region, but every one is represented by a species in the western polar regions belonging to the same genus. The watershed between the Yenesay and the Lena appears almost as important a boundary as Behring's Straits. The author notices that though the species of birds within the Arctic circle are few, the individuals may be counted almost by millions, a fact explained by the superabundance of food during the brief summer. For the fruit and seed eaters there is an unlimited supply of berries, "whilst insect-eating birds have only to open their mouths to fill them with mosquitoes." These little wretches, *Culex damnabilis* of Rae appear to abound to a degree unsurpassed, if equalled, in any tropical swamp. Says the author, Our hats were covered with them; they swarmed upon our veils; they lined with a fringe the branches of the dwarf birches and willows; they covered the tundra with a mist." They were told "wait a little and you will not be able to see each other at twenty paces distance; you will not be able to aim with your gun, for the moment you raise your barrel half a dozen regiments

of mosquitoes will rise between you and the sight," We wonder how those writers who seek to represent the mosquito as a sanitary agent, without whose aid "no animal higher than a reptile could have existed,"* will explain its presence in regions where malaria is altogether out of the question? But there is a further difficulty; how has such a taste for blood become developed among a race of beings not one in a million of whom ever tastes it, or even comes within scent of man or other mammal? How is it that the birds, especially when unfledged, escape their attacks?

The author mentions with surprise that he saw three specimens of the common gull (*Larus canus*) perched upon a tall tree, a phenomenon which may be witnessed at home.

Perhaps the most interesting chapter of the work is one written at Heligoland, and treating of the migration of birds. Mr. Seebohm considers that migration is comparatively of recent date. "It is not confined to any one geographical region, nor to any one family of birds, nor can he assume that it will be present or absent in every species of the same genus." He proposes the law that every bird breeds in the coldest country of its migrations. The stories of birds breeding a second time in their winter residence have, he holds, "the same scientific value as the stories of swallows having been found hybernating in caves and hollow trees." He reminds us that some species, such as the robin, the blackbird and the song-thrush, are stationary in England, but migratory in Germany. He suggests that these birds have only recently ceased to migrate in England, so that should our climate remain long enough favourable to their winter abode they will develope into local races with rounder and shorter wings than their continental kindred. He considers that birds were originally resident in the district where they now breed, and that the cause of their wanderings is want of food, not want of heat. But he remarks that it is supposed that many birds leave their winter quarters in southern climates because the heat dries up everything, and lessens the production of insect life." Now in the valleys of Asia Minor, in the gorges of Parnassus, &c., he found insects in profusion in May and June. Why then do insect-eating birds leave those regions in the summer? Not, on his own showing, from lack of food.

Mr. Seebohm doubts the correction between the routes followed by migratory birds and the position of submerged lands. He holds that the desire to migrate is a hereditary impulse to which the descendants of migratory birds are subject in spring and autumn, and which has in the lapse of ages acquired a force almost as irresistible as the instinct to breed in spring. "The direction in which to migrate appears to be absolutely unknown to the young birds in their first autumn, and has to be learned by

* Journal of Science, 1875, p. 225.

experience. The idea that the knowledge of where to migrate is a mysterious gift of nature, the miraculous quality of which is attempted to be concealed under the semi-scientific term of instinct, appears to be without any foundation in fact."

We must here conclude our notice of this pleasant and instructive volume, which we recommend to all lovers of natural history.

History of North American Pinnipeds; a Monograph of the Walruses, Sea-lions, Sea-bears, and Seals of North America. By J. A. ALLEN. Washington: Government Printing Office.

WE have here a valuable and singularly complete monograph of an order whose characteristics, distribution, and synonymy have till lately been involved in much confusion. It is strange to learn that even during the first quarter of the present century, the walrus was allowed to rank with such utterly remote forms as the elephant, the beaver, and the ornithorhynchus. Mr. Allen describes all the species which frequent the seas and coasts of North America. He accepts the division of the order into three families, the Odobænidæ, Otariidæ, and Phocidæ, the last mentioned, or the common seals, being the lowest and most generalised group. Under each species we find given the synonymy and bibliography—in many cases a very complicated subject—the external characters, sexual, individual differences, measurements of skulls, dentition, fossil remains, geographical distribution, habits, products, food, enemies, besides minor points. A very remarkable circumstance is that throughout the order the young are produced on land, and do not enter what is considered their natural element for some weeks. Concerning the sea-lion (*Zalophus californianus*), it is stated that the cubs "manifest great aversion to the water." The young sea-bears (*Callorhinus ursinus*) are at first very feeble and awkward in the water, and that "if put into it before they are five or six weeks old will drown as quickly as a young chicken." It is difficult to avoid the conclusion that the whole order is descended from some terrestrial carnivorous form, and has not yet become perfectly adapted to an aquatic life. Provided the temperature is sufficiently low they do not appear to suffer from a prolonged residence on shore, and in Sweden a young grey seal (*Halichœrus grypus*), has been known to travel at least thirty miles over land. As the food of all the species consists of fish, mollusca, and crustaceans, they are ultimately obliged to return to the sea.

Throughout the order we recognise a very high development of the brain and the nervous system, and most of the species are

sympathetic and affectionate among themselves, sensitive, curious, and capable of domestication. They are even said to be attracted by music—a fact which may, perhaps, throw some light on the classical fable of Arion and the Dolphin. Bearing in mind these attributes we cannot dwell without horror on the description of the seal hunts, or rather massacres, which we find in this volume. We learn that "at other times the young are used as a lure for the capture of their mothers. For this purpose they employ an iron implement having three barbed hooks, on one of which the young seal is impaled alive. The mother hearing its cries approaches it quickly, and immediately embraces it in the hope to free it, but in so doing presses the other barbed hooks into herself, and both mother and young are drawn out of the water together." An authority here quoted describes how, after a seal-battue, "occasionally from out of the bloody and dirty mass of carcasses, a poor wretch still alive would lift up its face and begin to flounder about." The same eye-witness mentions how all the time "hundreds of old seals were popping up their heads in the small lakes of water and holes among the ice, anxiously looking for their young. Occasionally one would hurry across a 'pan' in search of the snow-white darling she had left, and which she could not recognise in the bloody and broken carcass, stripped of its warm covering, that alone remained of it." It is saddening to think of the physical and mental anguish thus inflicted upon harmless creatures at the bidding of greed and fashion. What would be the outcry if one tithe of these cruelties were inflicted in the pursuit of knowledge! The "Devil's Walk on Earth" is incomplete without a verse telling how he smiled at seeing a lady in a seal-skin jacket canvassing for signatures to an anti-vivisection petition.

This work is one of the many valuable contributions to natural history which have appeared in connection with the "Geological and Geographical Survey of the Territories," and for which the Government of the United States is entitled to the gratitude of men of science throughout the world.

Unconscious Memory. A Comparison between the Theory of Dr. Ewald Hering, Prof. of Physiology at the University of Prague, and the "Philosophy of the Unconscious" of Dr. E. von Hartmann. By Samuel Butler, Author of "Life and Habit," "Evolution Old and New," &c. London: D. Bogue.

Above a year ago we had the pleasure of reviewing a work by Mr. Butler, entitled "Evolution, Old and New."* In that book

* Journal of Science, 1879, p. 487.

the author, whilst distinctly adopting the doctrine of organic development as opposed to that of individual and mechanical creation, no less distinctly repudiates "natural selection" as the cause to which the origin of species is due. Although not prepared to endorse this absolute rejection of the principle which in the hands of Mr. Darwin and Mr. Wallace has led or seemed to lead to such splendid results, we did not seek to conceal our approbation of no small part of Mr. Butler's views. Perhaps we might have spoken somewhat more strongly, but, never having been able to relish natural selection, which to us seemed like a glorification, if not a deification of the most painful fact in the universe, we feared to give way to a bias in the author's favour. It seems to us that natural selection, or, in other words, the struggle for existence, is more likely to reduce than to increase the number of species. Mr. Wallace expressly admits * that, "new species can only be formed when and where there is room for them." Hence the less severe the struggle for existence, and the less natural selection is brought into play, the more likely are new species to be called into existence.

In the same work Mr. Wallace further remarks:—"The most effective agent in the extinction of species is the pressure of other species, whether as enemies or simply as competitors.†

In a very similar manner, Dr. H. Behr, speaking of the native vegetation of California, says:—"Its very variation is a proof of a certain want of vitality, for any more vigorous organisation by superseding the weaker ones would have produced originally the monotony developed at present by the immigration of foreign plants." Here again the struggle for existence is held up, not as a multiplier, but as a reducer of the number of species. If such is its function in our time we can scarcely believe that it can ever have played the opposite part and been so largely instrumental in producing the present multitude of organic forms from a few original types. We often forget that out of the almost infinite array of animal and vegetable species the majority are rare. Now if it be true, as most naturalists admit, that a rare species is one that is verging towards extinction, what are we to infer?

Mr. Butler speaks of himself as "one of a small body of malcontents." But though few, perhaps, will join him in his total denial of the claims of natural selection to rank as an agent in the formation of species, those who assign it the sole place are rarer still. It has become almost a truism to say that selection pre-supposes variation; whence, then, springs the variation?

There is a serious difficulty in the way of Mr. Butler's hypothesis, or rather in that of the elder Darwin, and of Buffon, which he has revived. It is found that a pair of young birds,

* Highland Life, p. 55.

† Enemies or competitors: is not this a distinction without a difference?

brought up apart from the society of their own species, will yet, when their reproductive instinct awakes, construct a nest in exact accordance with the ancestral pattern, and this is very plausibly explained as a result of "unconscious memory." But why does a young male bird, if reared alone, fail to acquire the peculiar song of his race?

There is another problem which we wish to lay before the author. It has been pointed out that the peculiarly disadvantageous positionof the mouth in the shark can scarcely be due to natural selection. Can it have been developed from a "sense of need?"

In the present volume Mr. Butler brings before us the speculations of Prof. Hering, of the University of Prague, which singularly agree with the views expounded in "Life and Habit," and in "Evolution, Old and New." He then gives a version of the chapter on "Instinct," from the "Philosophie des Unbewussten" of Dr. von Hartmann, who refers the migrations and stratagems, the nest building, &c., of birds, and insects to a kind of *clairvoyance*. We might here take the preliminary objection that to explain one unsolved difficulty by another is but a very small service to science. Mr. Butler points out the erroneous character of some of Von Hartmann's assumed facts and of his conclusions, but many more he passes over. One of these errors must be, we should conjecture, the fault of the printer. We read that "an insect of the genus *bombyx* will seize another of the genus *parnopæa* and kill it, without making any subsequent use of the body." We presume that the names should be respectively *Bombus* and *Panorpa*. We quite agree with Mr. Butler in rejecting Von Hartmann's hypothesis, reared as it is upon a doubtful foundation.

The first appearance of life upon our globe has been a difficult question for all thinkers who appreciate the formidable character of the evidence against so-called spontaneous generation, and who are not willing to admit, with Mr. Darwin, an initial creative intervention. Again, it has been said that Dr. Erasmus Darwin refuted himself by consistently extending his theory to plants, which, it is contended, cannot feel a sense of need. Mr. Butler meets both these difficulties by assuming that "there is a low kind of livingness in every atom of matter." "Wherever there is vibration or motion there is life and memory, and there is vibration and motion at all times in all things." I would recommend the reader to see every atom in the universe as living and able to feel and remember, but in a humble way."

Further we read:—As for the difficulty of conceiving a body as living that has not got a reproductive system, we should remember that neuter insects are living but are believed to have no reproductive system. Again, we should bear in mind that mere assimilation involves all the essentials of reproduction, and that both air and water possesses this power in a very high

degree." We must confess our inability to accept this argument. We fail to see in air and water, which are not individualised, any properties which may be fairly interpreted as reproduction. In neuter bees, &c., the sexual organs are abortive rather than non-existent, as is proved by the fact that a difference of diet develops the larva of a working bee into a queen.

If we assume all matter as living, we are still met with the fact that what we call inorganic matter has never within human knowledge been transmuted into even the lowest plant or animal. Thus the difficulty of spontaneous generation remains unsolved.

So far, the work before us may be accepted as an interesting and thoughtful continuation of "Life and Habit" and of "Evolution, Old and New." But it is interpenetrated with polemical and personal matter, which we read with much regret, since, whoever may ultimately prove to be in the right, the interests of Science can scarcely fail to be compromised. On the grave charges here brought against Mr. Darwin it would be unfair to decide until both parties have been heard, and we do not see that a discussion of the personal character of any scientific man falls within our jurisdiction. Still we feel free to declare that had we, when reviewing Dr. Krause's work, been aware of the facts now brought forward, our critique would have been somewhat modified. If an editor or translator interpolates passages in any work, without distinct acknowledgment, he sins both against author and reader. If the additions and alterations were made by Dr. Krause himself, the public ought to have been told that the English version was based, not upon the original text as found in "Kosmos" for February, 1879, but upon a revised and amended issue.

But leaving Mr. Darwin out of the question, the author is but scantily courteous to Mr. Wallace, Prof. Huxley, and naturalists in general. We are struck with the following passage:—"From ladies (?) and gentlemen of science I admit that I have no expectations. There is no conduct so dishonourable that people will not deny it or explain it away if it has been committed by one whom they recognise as of their own persuasion. It must be remembered that facts cannot be respected by the scientist in the same way as by other people. It is his business to familiarise himself with facts, and, as we all know, the path from familiarity to contempt is an easy one." Again:—"Do not let him (*i.e.*, the reader) be too much cast down by the bad language with which professional scientists obscure the issue, nor by their seeming to make it their business to fog us under the pretext of removing our difficulties. It is not the ratcatcher's business to catch all the rats; and, as Handel observed so sensibly, 'every professional gentleman must do his best for to live.'"

That these sayings are very clever and very bitter we do not dispute. But are they justifiable, and what good purpose are they likely to serve? The denunciations which Mr. Butler,

showers upon our "persuasion" do not, however, blind us to the merits of his book, though we believe that not a few passages might be advantageously modified.

The Laws of Health. By W. H. CORFIELD, M.D. London: Longmans, Green, and Co.

This little work belongs to the series of "London Science Class Books," edited by Prof. G. C. Foster and P. Magnus, and contains much good advice. The author treats successively of health and of disease, with its predisposing and determining causes, of constitution, and of temperaments. Here it must be noted that he regards the nervous temperament as one of a marked tendency to disease and the lymphatic as a condition of strong predisposition to scrofula. He then enters upon the subjects of idiosyncrasies and of heredity. He remarks that "all people who live to a great age have good teeth," and again, "most very old people have been early risers." This may be correct, but do the converse propositions hold good? Do most people who have good teeth and who practice early rising attain a great age? We believe not; early rising is in some parts of England compulsory for the majority of the population, but the duration of life there is far from long. Perhaps, however, we may say that if a man of his own free will and pleasure rises early, it may be regarded as a proof of the possession of a strong constitution, since all persons feel themselves more languid in the early morning than at any other time The author justly condemns open waistcoats, tight-lacing, and high-heeled boots.

In comparing the open fire-places of England with stoves, and giving the preference, from a sanitary point of view, to the former, the author forgets that stoves are not necessarily made of iron, and that those whose outer surfaces consist of glazed fire-tiles are free from the disadvantages to which he refers.

In treating of food Dr. Corfield states that "flesh is more nutritious if eaten raw than when cooked, but less digestible." We do not perceive that he adds in this place the needful caution as to the introduction of entozoa and disease germs into the system through the medium of raw—or what is substantially the same thing—under-done meat. He speaks of the necessity of thorough cooking in case of diseased meat, but many readers may conclude that the precaution is not otherwise necessary.

We consider that this treatise will prove of very great utility.

The Power of Movement in Plants. By CHARLES DARWIN, LL.D., F.R.S., assisted by FRANCIS DARWIN. London: John Murray.

IT is well known that of late years Mr. Darwin has, with his usual ability and success, attacked the old traditional notion of an absolute distinction between plants and animals. His researches on the fertilisation of orchids, on insectivorous plants, and on the movements and habits of climbing plants, all militate against the supposition of an utterly inert and unconscious character so generally ascribed to the vegetable kingdom. Continuing his investigations he has now shown, by dint of a prolonged course of experiment and observation, that "all the parts or organs in every plant, whilst they continue to grow, are continually circumnutating,"—that is, the point of a growing stem, &c., is found to describe an irregular circular figure. This movement is not uniform, but consists—in some cases at least—of innumerable small oscillations. The phenomena thus produced closely resemble many of the actions performed, as is supposed unconsciously, by the simpler and lower animals. The author remarks that "even among allied plants one may be highly sensitive to the slightest continued pressure, and another highly sensitive to a slight momentary touch."

Mr. Darwin considers that the most striking resemblance between plants and animals is the localisation of their sensitiveness and the transmission of any influence from the part excited to some other part, which consequently moves. It is not, of course, contended that plants possess a brain or other true nervous centre, and a system of nerves by which it is connected with the whole body. But it is, to say the least, doubtful whether such structures exist in the lowest animals, and it is probable that where present they serve merely for a more perfect transmission of impressions and a more complete intercommunication of the several parts.

The author calls attention to the wonderful character of the tip of the radicle, which is remarkably sensitive:—"If the tip be lightly pressed, or burnt, or cut, it transmits an influence to the upper adjoining part of the root, causing it to bend away from the affected side; and, what is yet more surprising, the tip can distinguish between a slightly harder and a softer object, by which it is simultaneously pressed on opposite sides. If, however, the radicle is pressed by a similar object a little above the tip, the pressed part does not transmit any influence to the more distant parts above, but bends abruptly towards the object. If the tip perceives the air to be moister on one side than on the other, it likewise transmits an influence to the upper adjoining part, which bends towards the source of moisture."

Taking these various kinds of sensitiveness into consideration, Mr. Darwin pronounces it hardly an exaggeration to say that

the tip of the radicle thus endowed, and having the power of directing the movements of the adjoining parts, acts like the brain of one of the lower animals, where the brain, seated within the anterior end of the body, receives impressions from the sense-organs and directs the several movements.

The conclusions thus reached are therefore of great importance to the philosophy of Biology, and the work will consequently well repay the study of all sufficiently acquainted with botanical terminology.

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*Geschichte der Mathematischen Wissenschaften.** Von Dr. Heinrich Suter. Zürich: Orell Füssli and Co.

The three parts of this work now before us carry the subject down from the earliest times to the end of the eighteenth century. The author announces that his object has been to produce neither a critical history of mathematics nor a collection of the biographies of mathematicians. The former undertaking would have been, he considers, presumptuous within the available limits, and the latter useless. The history of Science, he justly holds, should be "no mere dry enumeration of facts, no chronological collocation of events, no collection of the biographies of its cultivators or enumeration of their works. It should present a total idea of the structure of Science in its organic development, beginning from the foundation and continuing to the latest stage of completion. Such a history of culture, viewed as the inward spirit of civilisation, he considers the most difficult, but probably the loftiest, task which the human mind can undertake. He holds that of all the sciences Mathematics afford the best opportunity for tracing out the intellectual progress of mankind, from the very severity of its character and the certainty of its movements. In this opinion there is much truth: Mathematics, from its very nature, is exempt from those delusions, false theories, and revolutions which have troubled the evolution of the other sciences. It has had no phases corresponding to alchemy, to quinarianism, to electro-biology. It has refused to ally itself with charlatanism, and its peaceful career has never been checked or diverted by persecution,

The modern neglect of the history of Mathematics he ascribes to the fact that historians rarely feel any interest in exact science.

In the first portion of this work the author naturally takes a somewhat wide scope. Pure mathematics could not then be

* History of the Mathematical Sciences.

distinguished from its applications in astronomy, in geodesy, or in commercial arithmetic. The nearer we approach the present day the more he is compelled to restrict himself to mathematics in the accurate acceptation of the term.

The great controversy as to the respective claims of Leibnitz and Newton to the priority of the invention of the differential calculus is, after a masterly and thorough-going criticism of the evidence, decided in favour of the latter. The author remarks, commenting upon Gerhardt's writings, "They show merely that even Germans can fall into that deplorable fault which we are accustomed to denounce as one of the chief national vices of the French,—unjustly glorifying their own intellectual heroes at the cost of those of other nations.

We regret that space does not allow us to prolong our survey of a work which supplies a hitherto well-marked deficiency in the history of culture, and which we can recommend as worthy the attention not merely of mathematicians.

Bulletin of the United States Geological and Geographical Survey of the Territories. Vol. V., No. 4.

THE volume before us affords fresh proof, if such were needed, of the munificence of the Government of the United States in producing works of the greatest value to Science, but which no private person and no publishing firm could undertake in consequence of the loss necessarily involved.

We have here a book of more than a thousand closely printed pages devoted entirely to the bibliography of American ornithology. Under every family of birds we find a reference to every work, journal, &c., in which an account of any species belonging to such family is to be found. In the case of the more important treatises a short summary is added.

Concerning the value of the work to ornithologists there can be but one opinion. Dr. Elliott Coues has fulfilled the laborious duties of compiler.

CORRESPONDENCE.

*** The Editor does not hold himself responsible for statements of facts or opinions expressed in Correspondence, or in Articles bearing the signature of their respective authors.

LIFE AND MIND, ON THE BASIS OF MODERN MEDICINE.

To the Editor of the Journal of Science.

SIR,—In the review of the above work, which appeared in your November number, I notice what appears to me a radical misconception of the author's standpoint. Allow me to make a few remarks in defence of his main thesis, as well as in deprecation of strictures on less important points. It seems almost superfluous to say that his antagonism is evidently directed not against Science itself, but against those scientists who confine themselves to special subjects, which, when studied without reference to their bearing on questions of universal importance, can neither conduce to the well-being of their devotees nor increase the sum of human happiness. The happiest life is the highest life. He who combines wide culture with a thoroughly healthy organisation has no doubt a far wider range of enjoyment than the mere savage, peasant, or even the average country squire; but how many of our modern *savans* answer to this description? Indeed the generally prevailing timidity and reticence which has led to a sort of scientific "Concordat" with religion, and rendered an "outspoken" book like "Life and Mind" so remarkable, must be abhorrent to a manly and truth-loving nature. So far is Dr. Lewins from being a foe to Science that the foundation of his thesis is identical with that of modern Physics and Biology.

Since the demonstration by Newton that Force is an immanent, inalienable, universal attribute of Matter, there has been no excuse for animistic hypotheses. Life is but one of the Protean manifestations through which this all-pervading activity is manifested. That heat, light, and explosive energy should be evolved from the chemical union of two apparently inert substances, is quite as wonderful and inexplicable as that a combination of unconscious atoms should form a conscious organism. It is no speculation, but an ascertained fact, that the healthy or diseased state of thought and sensation depends upon a corresponding

condition of the brain and nerves, and that there is no immaterial agent which can supply the deficiencies of these material organs.

Every medical practitioner is now a practical, if not a theoretical, materialist. For the baneful effect upon Science of the opposite theory I need only refer to the closing, by Constantine the Great, of the Asclepions, or temples of Æsculapius, which had been converted, by the influence of Hippocrates and his rivals, into schools of scientific medicine. No doubt hospitals were founded in their stead; but the result was the substitution, throughout the Byzantine Empire, of ignorant relic-mongers for trained physicians.

Since Hylozoism affords the only position from which we can successfully deal with Nature, we must not hesitate to apply its conclusions to the "Supernatural." It is equally impossible to prove and to disprove the existence of an "Infinite Mind;" but the doctrine of Omnipresence makes Pantheism a logical necessity, and the Pantheos must be the Substance or Noumenon of soul and body alike, which cannot therefore be distinct entities. Man is, on this hypothesis, a part of God; but the Divinity actually adored (like all ideas and sensations, like the visible world itself) is a part of man. All adoration therefore "becomes pure Hylotheism and self-worship." Since mind is but a function of the brain, personal immortality is clearly impossible; but since we thus lose not only heaven, but hell, and no longer believe that the vast majority of mankind are doomed to "æonial" torture, it can hardly be considered that our prospects have altered for the worse. Death is no longer regarded as a curse, but as a necessary link in the chain of life; and though the present Cosmos may not be immortal, the matter of which it is composed must be so, for every atom must retain its primal energies undiminished through all eternity. The death of religion will form a necessary era in the life of humanity; and if nothing but a temporary though fearful humiliation, such as has befallen other nations, can arouse England from her lethargic hypocrisy, no true patriot should shrink from the ordeal. Evil is but good in the making; and here I may appropriately refer to the quotation from Faust, upon which your reviewer animadverts. Throughout the drama Mephistopheles really is, as he mockingly describes himself,—

> "Ein Theil von jener Kraft,
> Die stets das Böse will und stets das Gute schafft."

He is evidently so regarded by "der Herr," in the speech beginning—

> "Du darfst auch da nur frei erscheinen,
> Ich habe deines Gleichen nie gehasst," &c.

Faust, whose aspiring nature finds no satisfaction in the dull

round of pedantry which contents his famulus Wagner, is represented as reduced to utter despair, and meditating suicide, *before* the arrival of his fiendish visitor. He dies in the joyous anticipation that his life will be crowned by the sight of a free people dwelling in a free land, which he himself has reclaimed from the sea.—I am, &c.,

C. N.

[We are perfectly ready to draw a distinction between Dr. Lewins and "Thalassoplektos." The theses of the former gentleman are a subject for legitimate scientific examination, and we think all who really value truth would like to see the question of Animism or Hylozoism fairly and fully discussed. The remarks of "Thalassoplektos" on scientific men in general, and on Faraday in particular, seem to us incapable of defence, or even of palliation.—ED. J. S.]

UNPLEASANT ALTERNATIVES.

To the Editor of The Journal of Science.

SIR,—Mr. Hingston, in his "Australian Abroad," describes certain feats which he saw performed by jugglers in India. Certain balls, marked with numbers, were thrown up into the air, where they disappeared out of sight. On any of the spectators asking for a certain number, that one, and no other, reappeared and fell into the circle. It is difficult to account satisfactorily for such phenomena. We cannot suppose that Mr. Hingston is knowingly and consciously relating an incident that never took place. We cannot imagine that these jugglers are acquainted with unknown natural forces or with novel applications of such as are already known, but of which our greatest physicists are ignorant. As little can we assume that superhuman beings hold themselves in readiness to execute the orders of these jugglers, especially as, if the latter have such allies in their service, they might turn their powers to far more profitable account than to collecting a few rupees from wondering spectators. Nor, if we consider that the performance took place in the open air, is it easy to conceive of any manner in which Mr. Hingston's senses might have been deceived. Is not this a matter worth scrutiny?—I am, &c.,

VERIFIER.

THE ANTI-VIVISECTION AGITATION.

To the Editor of the Journal of Science.

SIR,—You were only too true a prophet when, in 1876, you warned biologists and the medical profession not to hope that the Bill then under discussion would be accepted as final by humanitarian fanatics. It appears that, although it is doubtful whether time can be found by Government for the consideration of so vital a question as patent-law reform, yet a Bill for the total suppression of vivisection is to be introduced. We have allowed fanaticism and organised ignorance to steal a march upon us, and the Biological Research Defence League is still *in nubibus*. We must therefore wait no longer. Will it not be possible to procure formal protests against any further restrictions from all the scientific societies, London and provincial, which in any way concern themselves with the study of animal life; from the medical faculties of the Universities; from the Royal Colleges of Physicians and Surgeons of England, Scotland, and Ireland, &c.? Should not petitions against such restrictions be placed for signature at the offices of the medical and scientific journals? I have no doubt that Dr. Cameron, M.P., will undertake to deliver such petitions and to support their prayer. Unless we are active every experiment upon a living animal, which some sentimentalist may think proper to call painful, will be branded as a crime, and punished far more severely than torture inflicted upon animals out of wantonness or for amusement.—I am, &c.,

GRADUATE.

"MODERN CYNOLATRY."

To the Editor of the Journal of Science.

SIR,—I beg to enclose you a cutting from the "Boston Journal of Chemistry" for December, 1880, which seems to me strongly to confirm the position taken by your able contributor.—I am, &c.,

ANTI-ANUBIS.

"Sheep versus Dogs.

"There can be no doubt that the keeping of sheep by farmers in New England is a profitable industry, but the great difficulty

in the way of success is the peril from dogs. Our towns are full of worthless dogs, and it is found impossible to prevent their cruel slaughter of our sheep in pastures. A few weeks ago a neighbour placed one hundred sheep on a farm near to Lakeside, and in one night twenty-seven of them were cruelly bitten, killed, driven into the lake, or drowned. Several of them swam across the lake, and were found exhausted in the woods on the opposite shore. For all this damage he will receive only about one hundred dollars from the county. We need more stringent dog laws. The license should be raised to five dollars for keeping a dog, and the penalty for not obtaining a license should be greater than now. If farmers will unite in securing from the legislature more stringent laws, sheep raising can be resumed in New England with profit."

SCIENCE IN THE WITNESS-BOX.

To the Editor of the Journal of Science.

SIR,—The following extract from the "Magazine of Pharmacy" may be of some importance to your readers, since it evidently applies not merely to the medical profession, but to chemists, engineers, microscopists, and other scientific men whose unpleasant duty it may ever become to give evidence in a court of justice:—

"A high compliment has been paid by Mr. Justice Stephen to the medical profession of Leeds. It appears that Dr. Allbutt, of that town, and Mr. Stotter, of Wakefield, gave evidence recently at the Leeds Assizes, before Mr. Justice Stephen, relative to the injuries which a young lady had received in an accident on the Lancashire and Yorkshire Railway. At the close of the case his lordship said that the medical evidence of these two gentlemen was a pattern of what such evidence should be. He was in the habit of hearing medical evidence in all parts of the country, and Leeds was the only town where he never heard those unseemly disputes between the legal and medical professions which occurred constantly at other places. Here there was a certain number of gentlemen, the leaders of the medical profession in the Great School of Medicine in Leeds, who had set an admirable example for many years past of truth and candour and straightforwardness in the witness-box, and he was happy to see that their example was being followed by the younger members of the profession. When a man really tried to tell the truth, the whole truth, and nothing but the truth, in plain and simple language, notwithstanding what consequences might be drawn from it, or

whether he was called on one side or the other, bullying in court and things of that kind ceased at once."

It seems to me that this "compliment to the medical profession of Leeds" is in reality a blow aimed at their colleagues in other parts of the kingdom. Mr. Justice Stephen evidently seeks to convey the impression that "bullying in court and things of that kind" are not due to the discourteous manner in which counsel take advantage of the license allowed them, but to a want of "truth and candour and straightforwardness in the witness-box." I must protest most emphatically against this assertion. The object of counsel is, of course, to prevent "the truth, the whole truth, and nothing but the truth" from being told, if such truth bears against their clients; and if they cannot hinder its utterance they seek, at any rate, to bewilder the minds of the jury and to insult the witness. I consider that Mr. Justice Stephen, in his remarks, has grievously wronged the medical profession and other men of science ever called on as experts.—I am, &c.,

B. P.

NOTES.

An eminent physician of Dublin, referring to "those erratic medical hybrids, the lady doctors," very justly remarks, "There are some masculine women just as there are some effeminate men. Neither are good types of their kind; and it needs no serious argument to prove the futility of any attempt founded on such exceptional cases, on the part of either sex, to fill the place and assume the functions of the other."

According to the Boston "Herald," an establishment for the manufacture of "bogus diplomas" has been discovered in that city. It is supposed to have manufactured about one hundred doctors, at prices varying from 100 to 145 dollars each.

According to the "Medical Press and Circular," certain Scotch professors—in particular Prof. Blackie and Prof. Charteris, both of Edinburgh—have been indulging in the customary onslaught on Physical Science, on account of its alleged materialistic tendencies.

An entomologist of Elbeuf, M. Levoiturier, according to "Les Mondes," has succeeded in distinguishing wools of different growths by means of the coleopterous insects found in the bales. In Australian wool he has identified 47 species of insects, 52 in South African, 30 in that from Buenos Ayres, 16 in Spanish, and 6 in Russian. As the origin of a sample of wool is a matter of considerable importance to the consumer, this is an unexpected service which Entomology has rendered to commerce.

Prof. Klebs, of Prague, has found in subjects dead of typhoid fever peculiar microbia, of about 80 micromils. in length and 0·5 to 0·6 in breadth. They are chiefly found in the parts most affected by the disease, and are absent in the bodies of those who have died from other causes.

The Copley medal this year has been awarded to Prof. J. J. Sylvester for his mathematical researches: one of the royal medals has been decreed to Prof. Jos. Lister, F.R.S., for his investigations on the antiseptic system of surgical treatment, and the other to Capt. A. Noble, F.R.S., for researches on the action of explosives. The Rumford medal has been voted to Dr. W. Huggins, for investigations in astronomical spectroscopy; and the Davy medal to Prof. C. Friedel, of Paris, for chemical discoveries.

According to the "Medical Press and Circular," a memorial in favour of cremation, numerously signed by physicians and surgeons, has been presented to the Home Secretary.

Prof. H. L. Smith, of Kenyon College, in the new American periodical "Science" (1880, vol. i., p. 26), remarks upon difficulty of effectually preserving dry mounts; the appearance known as *sweating* sooner or later taking place, and spoiling—or at any rate impairing—the view of the contents of the cell. Prof. Smith has tried mounts of nearly every kind, and uniformly with the same result. Mr. F. Kitton, in writing on the same paper, says that he is unable to suggest a remedy. All experiments with the most varied materials have failed. The fault seems to lie in the cover glass itself, the same "sweating" frequently taking place in the lenses of eye-pieces.

According to G. H. Schneider, vital processes are distinguished from mere chemical combinations by the circumstance that they lead to a final phenomenon, which again occasions a repetition of the whole series of phenomena of the course of life.

It appears that the promised subscriptions to the Liverpool University Fund amount to nearly £100,000.

The next meeting of the French Association for the Advancement of Science will take place in Algiers, April 14th, 1881.

As a practical comment upon the article "Cynolatry," in our December issue, it appears, according to the "Medical Press and Circular," that about twenty persons were bitten by a rabid retriever in the outskirts of Leeds, in one day!

According to Dr. C. C. Merriman, insectivorous plants are more numerous and more perfectly developed in the Central Lake regions of Florida than elsewhere.

Dr. Chervin has studied the medical geography of France, with especial reference to infirmities which disqualify for medical service. The regions most affected are the north-west, the centre, and the south-east.

A Mr. Plimsoll thinks that he has discovered a plan by which a great proportion of coal-mine accidents may be prevented.

The rhinoceros discovered in 1877 in Siberia proves to be a specimen of *R. Merckii*, a species intermediate between *R. antiquitatis* and the kinds now extant, but more nearly approaching the former. Fossil remains of this form have hitherto been found only in Western and Southern Europe, and it is therefore interesting to find a specimen with the skin, hair, &c., well preserved, in the very coldest part of Siberia.

"Les Mondes" describes a spectroscope specially devised by M. Lamansky for the study of the phenomena of fluorescence.

We regret to learn the death of Dr. W. Lauder Lindsay.